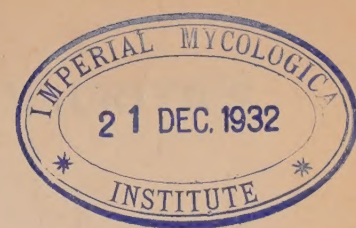


19/5



SUGARCANE RESEARCH STATION, MAURITIUS.

STAFF

Senior Geneticist	...	... A. G. G. Hill, B.A., B. Agr., A.R.C. Sc., I.
Scientific Assistant	...	... G. Mazery, Dp. Ag.
Bio-Chemist ...	...	... N. Craig, M. Sc.
Scientific Assistant	...	... P. Halais, Dp. Ag.
Research Botanist	...	... Dr. H. Evans, Ph. D. (not yet assumed duty)
Scientific Assistant	...	... A. d'Emmerez de Charmoy, Dp. Ag.
Cane Breeding Officer	...	... A. de Sornay, Dp. Ag.

SECOND ANNUAL REPORT

OF THE

SUGARCANE RESEARCH STATION, MAURITIUS

FOR THE YEAR 1931.

INTRODUCTION.

During the whole of the year under review, Mr. A. G. Hill has been acting Director of the Department of Agriculture, and as such has had no time to devote to the practical side of cane breeding. For this same period, Mr. N. Craig has been in charge of the Sugarcane Research Station.

Dr. H. Evans was selected for the post of Research Botanist in April and since that time has been engaged on a special course of instruction on root stock studies at East Malling Experiment Station, Kent.

As a result of these two officers not being available for work in their substantive posts it must be pointed out that a full programme of research work could not be attempted. Consequently those lines of research most likely to be fruitful were followed. The most urgent and promising line of work is that of raising new cane varieties, and every endeavour has been made to maintain the work already started. Although the White Tanna variety is at present most widely cultivated, there seems to be distinct possibilities of breeding with three definite objects in view. First of all, for planting on estates, a high yielding cane of good sucrose content capable of responding to liberal manurial applications is required. A cane of this type, however, may be a failure in those parts of the island heavily infested with *Phytalus Smithi*. For these regions, a cane with very good tillering power and an extremely strong root system would seem to be indicated, and with this object in view, the two vigorous canes Co. 213 and Uba Marot have been used extensively as male parents. If such a cane could be raised, a considerable increase of production could be expected, as at the present time about 30% of the land planted with sugar cane is infested with the above pest. Thirdly, a hardy variety is required for the poor soils, and for the small planters who do not give very liberal applications of manures. It may be found that the requirements of the latter two types may be filled by one cane variety, as they both demand hardy types, good tillering power and medium yields.

Mr. Halais, my assistant, remained constantly on soil investigational work, but the remainder of the staff were engaged in cane breeding, or work related thereto. Mr. d'Emmerez was largely engaged in Field Work, especially in connection with the laying out of new field experiments and with the reaping of both the Manurial and Variety Trial Experiments started in 1930.

A reduction of the grant of the Empire Marketing Board from Rs. 26,667 to Rs. 22,204, towards the upkeep of the Sugarcane Research Station, is under consideration.

2. WEATHER CONDITIONS.

Considered as a whole, the weather conditions at Réduit have not been very satisfactory for plant growth during the year. Thus in the first four months of the year, there was abundant rainfall, but from May to October, there was very little. Good rains fell, however, in November so that the 1932 crop has had an excellent start, but during December it was rather dry.

At Pamplemousses, the distribution was much better than at Réduit and as irrigation water is available, conditions for growth at this station must be considered as being favourable during the whole period.

Temperature was generally above normal, especially during the winter months of June to August.

The island was visited by the worst cyclone since 1892, from March 5 to March 8. During this period, the rainfall was exceptionally heavy, and in many cases rain gauges were blown over or overflowed so that rainfall figures are scant. At the Central Experiment Station, the recorded rainfall from the 5th to the 9th March was 1,125 mms. The maximum wind velocity was 89 miles per hour whilst at Pamplemousses the maximum was 75 miles per hour. Furthermore, high wind velocities of over 60 miles per hour were encountered for three days. In conditions such as these the losses to standing crops were great, as many canes, especially big virgin canes, were broken or uprooted, whilst in all cases the leaves were torn to shreds, with the result that practically no stem growth took place until new leaves were produced. This point was very well shown by the cane growth measurements, which showed that the rate of growth was very low for a period of about one month after the cyclone. A loss which cannot be estimated is that of the soil which is removed due to the extremely heavy precipitation. In some cases new water courses were formed through fields of standing canes which, together with the soil were completely washed away, leaving the underlying rock bare.

As far as the Sugarcane Research Station is concerned, the most serious damage done was to the Nitrogen Manurial Experiments. Five of these were reaped, but considerable doubt must be thrown upon the results obtained from them. A certain amount of damage was done to the 1930 seedlings, especially those newly planted out. The 1929 seedlings, at Pamplémousses Experiment Station, which were fairly tall, suffered rather heavy damage.

TABLE I.

Temperature and Rainfall at the Central Experiment Station and Pamplémousses Experiment Station

	Central Experiment Station		Pamplémousses Experiment Station
	Temperature	Rainfall	Rainfall
January	24.4°C	450 mms.	336 mms.
February	24.3	528	569
March	24.1	1,155 ± 10	620 (?)
April	23.3	148	207
May	20.8	84	153
June	20.5	60	83
July	19.0	35	50
August	18.5	42	48
September	19.5	35	50
October	20.4	21	16
November	22.2	160	132
December	23.7	46	58

3. CROSSING WORK.

The crossing work during the arrowing season of 1931 was carried out at three centres: The Central Experiment Station, Réduit; Béga S.E., and Pamplémousses Experiment Station.

It must be noted that the canes did not arrow profusely this season, a fact probably due to two factors:—first, a large number of the more advanced canes, and therefore those which might be expected to flower the more profusely, were either broken or very severely damaged by the cyclone; secondly, the winter was exceptionally mild, the temperature remaining constantly above normal. It is generally considered locally that arrowing commences with the cold weather, and the cessation of vegetative growth. Furthermore, on account of the cyclone, the canes were very badly lodged, so that in those fields planted in single row trials, great care had to be exercised in the choice of arrows to be used in crossing, as it was sometimes extremely difficult to determine from which variety an arrow was produced.

In view of the difficulties encountered, it was not considered practicable to work to a definite crossing programme. A limited programme of crossing work however was drawn up, to test the inheritance of resistance to Gumming Disease. This programme was almost totally revised later in the season. The crosses which were actually carried out, were determined by the female and male varieties available at the time. This method although generally unsatisfactory, resulted in many crosses being made which would not have been done otherwise, with the result that other female parents which set seed freely were discovered.

4. BREEDING MATERIAL.

Several of the varieties which in the 1930 season had proved themselves to be good parents did not flower at all or only sparsely in 1931. Thus BA.11569, the most prolific female parent of 1930, did not give a single arrow at any of the three stations in 1931, while R.P.6 flowered only at Béga and M.2716 gave only comparatively few arrows. The various Glagah varieties flowered profusely, but the main flowering occurred before the noble canes had started, so that it was only possible to use the late Glagah arrows for the production of interspecific hybrids. The natural Kassoer did not flower, but four of the 1930 first nobilised Glagah seedlings (131.P x Glagah Djatirot) gave arrows. Although these seedlings were not of a very highly desirable type, they were used in the hope of producing a second nobilised Glagah seedling of good type one year earlier than would otherwise be the case. P. O. J. 2878 produced a fair number of arrows, which were used as female parents.

5. CROSSING TECHNIQUE.

In general the methods employed were similar to those used in the previous year, but many modifications were introduced. The open crossing method of Java was the principal one to be employed. When the crosses of noble canes with *Saccharum spontaneum* were being made, they were carried out inside thin muslin bags in order to prevent any of the fuzz from the male arrows being blown about. It was noticed that this method had a still further good point. Often when the crossings were being made, it was found that the male arrows especially those that are very flexible, were blown away from the female arrow, on account of the strong S.E. trade winds which are encountered in the winter months. When the arrows are surrounded by a thin muslin bag, which does not affect the air supply and which only gives a very light shade, this trouble is not experienced, so that subsequently many crosses were carried out in these bags. In no case was an arrow so protected broken by the wind, which sometimes attained a velocity of over 30 miles per hour. Although this method makes it slightly more difficult to arrange the arrows whilst the cross is in progress, yet it seems to be preferable to that of fitting up wooden shields as a protection against the wind.

The cages in which carefully controlled crosses were made were redesigned, the most important difference being that they were provided with a thatched roof, and the sides shaded with palm leaves. As a result of these alterations, the temperature inside the cages was never very high, the temperature being on an average only 3°C higher inside than outside, during the hottest part of the day. The average difference between the wet and dry bulb thermometers was about 4°C.

The crossing lanterns were also modified and provided with shade over the top, and so arranged in the field that the calico sides faced S.E. and N.W., so that they received maximum aeration on account of the prevailing wind.

The male arrows used in the Open Crossing Method were kept in 0.03% sulphur dioxide solution, with satisfactory results on the whole. The sulphur dioxide solution was changed and one internode cut off every second day as a routine practice. Even though these precautions were taken, it was noticed that the period during which the male arrows remained fresh varied greatly, dependant upon the variety. As an example the variety M. 1318 may be mentioned. Only very few arrows of this variety were available and a cross in a lantern with this variety as male was started on June 21, only one arrow being used. This arrow continued opening flowers normally and shedding viable pollen until July 3 when the female arrow had finished flowering. The male arrow was then removed and placed in a cage and the fuzz when ripe was sown and eight seedlings obtained. M. 2716 is also a variety which lasts well in this solution. On the other hand, of the few arrows of D. 109 available at the Central Experiment Station, not one lasted for a period of more than 3 days.

A certain number of canes were rooted for isolation in the cages, but again this method of isolation did not prove very efficient. Some experiments relating to this question are reported later.

6. INTER-GENERIC CROSSES.

An attempt was made to breed early maturing hybrids by crossing noble varieties of sugar cane with various varieties of *Sorghum*, as has been done at Coimbatore. In all five crosses were made, the *Sorghum* in each instance being used as the male parent. From one of these crosses four seedlings were produced, but from present appearances they are selfed seedlings. From the remainder no seedlings were obtained.

7. A COMPARISON OF THE DIFFERENT METHODS FOR PRODUCING CROSSES.

In all nine crosses were carried out in the two reconstructed cages at Réduit, but unfortunately in the case of seven of these the female parents were known not to be of a prolific nature, and from these only 35 seedlings were produced. From the other two arrows (M. 3319)—a fertile variety—a total of 442 seedlings were produced, so that there are indications that the changes made have had been beneficial.

In all twenty crosses were made in the Lanterns, with the result that on an average each cross produced about 335 seedlings. The average for Open Crosses during the 1931 crossing season was about 191 seedlings per arrow, so that the Lantern Method had certainly no ill-effects upon seed setting, but rather the reverse. Twenty three crosses were carried out in semi-rigid bags, giving on the average 233 seedlings per arrow. These two methods seem to have great possibilities, as in both cases the female arrows are protected from mechanical damage by wind, and from the access of foreign pollen, so that greater reliability may be placed on the parentage of the seedlings so produced than on those produced by the Open Crossing Method. Furthermore, these methods have a big advantage in a season such as the one under review, when male arrows were very scarce at times. In fact, many of the crosses performed by these two methods could not have been attempted by the open crossing method. Even when only one or two male arrows were available a cross could be made with a male sterile arrow, as only one male arrow need be placed in

the lantern or bag at a time, and if all the male arrows are finished before the female has opened all its flowers, the latter may be kept in the isolation chamber without any fear of further pollination taking place.

8. RESULTS OBTAINED.

The numbers of seedlings produced at the various crossing stations are given in Table III and the analysis of all crosses made in Table XXI.

The following points with regard to the analysis of crosses are of interest. In all 7 crosses of the combination P.O.J. 2878 x Uba Marot were made, giving an average of 753 seedlings per arrow. Uba Marot is a cane of unknown origin but possibly contains some wild blood. It shows very vigorous growth, but is low in suchrose. The 44 crosses of P.O.J. 2878 with noble canes produced on an average only 40 seedlings per arrow. A similar point has been noticed with P.O.J. 213. In 1929, prior to the opening of the Sugarcane Research Station, the Cane Breeding Officer produced a large number of seedlings from the combination P.O.J. 213 x Uba Marot, but in subsequent years this female variety was crossed with noble canes, and only very few seedlings were obtained. It would thus seem that although a female arrow may be very prolific when crossed with certain male varieties, yet with others only comparatively few seedlings may be expected.

A further point which deserves mention is that, while the period of maximum seed setting at Béga occurs early in the flowering season, this period at Réduit 3 miles distant follows some time later in about the middle of the flowering season, and even in the last crosses made, some highly satisfactory results were obtained.

The merits of the different types of crosses are shown in Table II, where the average number of seedlings per cross is given.

TABLE II.

Average number of seedlings per cross :—

Type of Cross	Réduit and Béga	Pamplémousses
Cage ...	53	26
Lantern ...	335	465
Semi-rigid bags ...	233	122
Open ...	191	299

9. LIST OF GOOD PARENTS.

An analysis of all crosses made this year shows that the best female parents, judged from the number of seedlings produced, were as follows :—at Béga : M.2016 ; 131P ; R.P.6 ; M.117 ; at the Central Experiment Station : M.10926 ; M.1025 ; 55/74 ; M.3319 ; M.422 ; M.2522 ; and at Pamplémousses Experiment Station : M.3319 ; M.1022 and 131P.

The best male parents at these stations were :—M.3517 ; M.2716 ; Senneville ; D.K.74 ; Uba Marot at Béga ; M.3517 ; M.1318 ; D.K.74/70 at the Central Experiment Station, Réduit and M.2316 ; Senneville ; Striped D.109 ; M.5019 ; Co. 213 and Uba Marot at Pamplémousses Experiment Station.

Glagah has not been taken into account in the above lists. Again P.O.J. 2878 gives a high average because of the Uba Marot crosses, whilst with noble canes it only gives a moderate number of seedlings per arrow.

10. SEEDLING TECHNIQUE.

As soon as the female arrows had finished flowering, they were enclosed in a thin muslin bag previously sterilised in an autoclave and supported on a light bamboo framework. The arrows were not cut until a fair amount of the fuzz from the top had been shed. The period between the opening of the last flowers and the cutting of the arrows varied considerably even in the same variety, the interval varying from 17 days to 45 days with P.O.J. 2878.

The planting mixture used at Réduit consisted of 2/3 soil and 1/3 well rotted farmyard manure, the soil being sterilised by heat before use.

As one of the greenhouses at Réduit intended for the quarantine of newly introduced canes was unoccupied, this was used for the seed boxes. During the cold weather, all the windows were kept closed, save during the warmest part of the day, when a few of those on the leeward side were opened. This has probably been the most beneficial change introduced during the year, as the germination and growth of the seedlings have been very much better than in the previous year.

At the Pamplémousses Experiment Station, the sowing mixture was similar to that at Réduit, but it was not roasted before use, the boxes being kept outdoors, as previously.

At the Central Experiment Station, the seeds germinated on the whole quickly and the subsequent growth was vigorous. A certain amount of trouble was caused by the surface growth of a red ascomycete, but in only very few cases were the seedlings attacked by the fungus *Pythium* Sp. When the trouble was detected in the early stages, the attack could be controlled by giving the soil a copious watering with a solution of "Cheshnut Compound". This disease does not cause the rapid death of seedlings, but rather general stunting with slow death. In one box an attack of a much different nature occurred, when the seedlings were some four inches high. This disease caused by *Pythium* sp. resulted in a very rapid wilting and almost immediate death.

At Pamplémousses, a very serious attack of root disease occurred in nearly all the boxes, due probably to the fact that the soil had not been roasted. All these boxes were watered with a solution of Cheshnut Compound, and within a week, the seedlings showed unmistakable signs of recovery, after which they grew normally. In all subsequent sowings, the soil was watered with this solution previous to the fuzz being sown, and no further case of root trouble occurred.

The growth of the seedlings at Réduit, in the conditions described was more vigorous than at Pamplémousses, so much so that it was possible to commence potting out at the former station some weeks earlier than at the latter. The majority of the seedlings were transplanted from the boxes into earthenware pots, but some thousands were transplanted into baskets made from cane leaves. A certain number were also planted out into beds, where there was a much smaller mortality amongst the transplanted seedlings than in pots. Unfortunately, however, when the time comes to plant in the field, it is a much more difficult operation to transfer from beds than it is from pots. Some 150 were transplanted direct from the boxes into the field and although the mortality was fairly low the labour and expenses of carrying water until they become established is so heavy as to render this method impracticable on a large scale.

When the pots were arranged in square groups of 100 pots, it was difficult to weed the centre ones without causing damage to those at the side, and moreover the former were taller but thinner than the latter on account of shading. Consequently, the pots are now arranged in blocks each consisting of four lines. Good growth was maintained without any application of artificial fertilisers, but in order to give them a little more vigour, they were given an application of two grammes of sulphate of ammonia in solution per pot, a short time before planting out in the field.

Approximately 29,000 seedlings—19,000 at Réduit and 10,000 at Pamplémousses, have been potted out and are now being planted in the fields. The planting distance at Réduit remains the same as last year, namely 5ft. x 2½ft., but at Pamplémousses it has been increased to 4½ft. x 2½ft., as it has been found that 4ft. x 2½ft. is too close to allow of easy inspection of the mature canes. At the former station, irrigation water is available for one field containing about 2,700 stools, but at the latter it is available for all fields.

Owing to the remarkably good growth of the seedlings at Réduit, it was possible to commence planting out in the fields in the middle of November, i.e. about seven weeks earlier than was possible with the 1930 seedlings. It has been found an advantage to plant out seedlings as soon as possible after they are really established in the pots, as they make more rapid progress in the field

TABLE III.

NUMBER OF SEEDLINGS PRODUCED AT THE VARIOUS STATIONS.

Crosses	Réduit	Béga	Pamplémousses	Total
Intergeneric crosses	4	...	...	4
Noble crosses	12,288	16,085	18,323	46,696
Interspecific crosses	1,212	13,702	6,425	21,339
Uncontrolled crosses	1,701	...	390	2,091
Selings	1	45	2,712	2,758
Total	15,206	29,832	27,850	72,888

By the end of December, nearly 6,000 seedlings had been planted out in the fields at Réduit, and about 4,500 at Pamplémousses. It is intended to plant out about 12,000 at the former and 10,000 at the latter station.

Many of the surplus seedlings have been distributed to estates, where they are being planted at the expense of the estates. These seedlings, when mature, will be selected by an officer of this Station, and the selected seedlings will undergo 10 hole trials in two localities, i.e. on the estate concerned and at the Central Experiment Station. The estates which received these seedlings are given in Table IV, together with the crosses provided.

TABLE IV.

Estates to which seedlings have been provided:—

Estates	Seedlings supplied
Alma S. E. ...	M. 10926 × DK. 74/70; M. 10926 × M. 3517; M. 10926 × M. 1318.
Beau Bassin ...	M. 10926 × DK. 74/70; 131P × Uba Marot.
Beau Vallon S.E....	M. 3319 × Senneville; M. 422 × M. 3517; M. 2016 × M. 3517; P.O.J. 2878 × Uba Marot.
Britannia S.E. ...	P.O.J. 2878 × Uba Marot; 131P × Co. 213; 131P × Uba Marot.
Ebène S. E. ...	P.O.J. 2878 × Uba Marot.
Trianon S. E. ...	M. 323 (G.C.); M. 2620 (G.C.); P.O.J. 2878 × Uba Marot.
Savannah S. E. ...	M. 117 × M. 2716; R.P. 6 × M. 2716.

11. 1930 SEEDLINGS.

In all approximately 8,100 seedlings were planted in the fields at Réduit and about 8,900 at Pamplémousses during the period January to March. About 2,000 seedlings were also planted out at Beau Vallon S. E.

The seedlings at the Central Experiment Station at Réduit made good growth to start with, but on account of the exceptionally dry winter months, very little growth was made from June to the middle of November. Much damage was done by stem borers, especially in the period just after the cyclone, and also a fair amount by deer. Consequently these seedlings will be selected in July 1932, with the exception of First Nobilised Glagah crosses and the P. O. J. 2878 x Uba Marot cross which are now ready.

At the Pamplémousses Experiment Station, good growth has been maintained throughout the year, as the seedlings received regular applications of irrigation water. Consequently with the exception of those planted out last, these have undergone a first selection, eighty one varieties having been selected for further trial in nine Latin Squares, each containing nine of the new varieties together with BH. 10/12 as the standard cane. The best eighteen of these varieties are also being planted in two Latin Squares at the Central Experiment Station, so that they are undergoing trial under two different sets of conditions.

The seedlings grown at Beau Vallon were selected in October; twenty of these are now undergoing trial both on the estate and at the Central Experiment Station.

The method of selection was based on the vegetative characteristics of the standing cane, together with a factor combining the weight of cane in the stool with the total solids in the juice as determined by the Hand Refractometer. Three cores from different canes, one from the top, one from the middle and the other from the base, were taken for the examination of the juice.

It is interesting to remark the comparison between the seedlings raised from fuzz imported from Java and containing wild blood, and those from crosses made in Mauritius between noble canes. The latter are very much more regular than the former, and consequently the task of selection is very much more difficult, the general average being much higher than in the Java seedlings, where the number above a certain standard is few.

12. MANURIAL EXPERIMENTS.

On account of the damage caused by the cyclone of March 1931, and by the attacks of *Phytlus Smithi*, only five of the Nitrogen Manurial Trials could be reaped profitably on an experimental basis. In addition, one experiment to test the combined effect of Nitrogen and Potash, applied as Nitrate of Potash, was reaped.

The details of the manurial treatments, etc., of these nitrogen experiments together with the calculated results are given in Tables V to VII.

It is extremely unfortunate that owing to the damage caused by the cyclone, great doubt must be thrown upon the validity of the results, in that they may be not at all applicable to more normal years. For some years, it has been considered by the Department of Agriculture, that when the land is in a high state of fertility and when sufficient quantities of good farmyard manure are applied there is little or no response to applications of artificial nitrogenous fertilisers to virgin canes.

As can be seen from the results of the five Nitrogen trials, there is on the whole a singular lack of response to the applications of artificial fertilisers. In not a single case has a significant increase been obtained, in fact, the increase in every instance has been less than the probable error of the experiment. The results point very definitely to the need for closer investigation into the problem, in order to allow of a definite answer being given to the question:—"Does it pay to add sulphate of ammonia or nitrate of soda to virgin canes?"

The results of the Nitrate of Potash Experiment conducted at Rivière des Anguilles S.E. are given in Table VII. In the case of the "A" and "B" plots, small, but not significant, increases in yield have followed the application of small or medium applications of nitrate of potash. In the case of the "C" plots, there is a decrease in yield—not significant—which is due to one of the "C" plots giving very much less than the neighbouring standard plots, to the extent of nearly 6 tons per acre.

In one soil sample from this estate, it was found that the pH value was fairly high (6.4) and that there was a high proportion of exchangeable bases in the soil, the percentage saturation being about 60%. Consequently results obtained from this class of soil cannot be applied to the more highly leached soils of the wetter regions, where the pH may fall to about 5.3 and where the soil is almost devoid of replaceable bases, the percentage saturation falling in some cases to about 10%. However it may well be that the experiment is very suggestive for soils of the former class, which are generally situated in the warmer and drier regions.

A nitrogen manurial trial was also carried out on this estate, and it is seen that in the "A" and "C" plots a slightly smaller yield has been obtained than in the standard plots, whereas in the "B" plots there has been an increase of about 3 tons of cane per acre. There is some reason for stating that from a consideration of the two sets of results, the addition of Potash has apparently been without effect.

13. MANURIAL TRIALS, 1931.

During the year, further manurial trials were laid down on several estates in different parts of the island, on the same plan as last year. These experiments have all been designed to test the optimum quantity of any one element to be applied to virgin canes. The series include four with nitrogenous, five with phosphatic and three with potash fertilisers.

The situations of these trials are shown on Map I.

TABLE V.

Estates	Beau Vallon S. E.	Labourdonnais S. E.	Rivière des Anguilles S. E.	Rose Belle S. E. (New Grove)	Savannah S. E.
Variety ...	White Tanna ...	BH. 10/12 ...	S. No. 4 ...	White Tanna ...	55P and 131P ...
Area of each plot ...	0.15 acres ...	0.25 acres ...	0.25 acres ...	0.22 acres ...	0.37 acres ...
Date of Planting ...	3. 4.1930 ...	30.5.1930 ...	7.5.1930 ...	8.10.1929 ...	4.3.1930 ...
Manures, etc. applied before planting	500 kilos lime, 14 barrels of molasses	...	...	...	...
Manures applied at time of planting	15 tons farmyard manure per acre	7 tons farmyard manure per acre.	8 tons farmyard manure, 50 kilos goat manure and 50 kilos scums per acre	5 tons scums ...	...
Further applications of manure with date of application	12 tons farmyard manure per acre 30.8. 1930	15 tons Saccharogene per acre 29.12.1930.	12 tons farmyard manure per acre 13.9. 1930	14 tons farmyard manure per acre 14.6. 1930	20 tons farmyard manure and 4 tons lime per acre 18.7.1930.
All plots received artificials	50 kgs superphosphate, plus 50 kgs nitrate of potash on 22.5.1930	...	100 kilos of guano phosphate on 7.5.1930, plus 50 kgs sulphate of potash on 19.7.1930	50 lbs. Nitrate of soda plus 60 lbs. Sulphate of potash	100 kilos sulphate of potash.
Additional artificial fertilisers applied :—					
"A" PLOTS ...	50 kilos of sulphate of ammonia per acre	60 kilos sulphate of ammonia, plus 60 kilos nitrate of soda per acre	50 kilos nitrate of soda per acre	20 lbs. of sulphate of ammonia, plus 20 lbs. of nitrate of soda per acre	100 kilos of nitrate of soda.
"B" PLOTS ...	100 kilos of sulphate of ammonia per acre	120 kilos sulphate of ammonia, plus 120 kilos nitrate of soda per acre	100 kilos nitrate of soda per acre	40 lbs. sulphate of ammonia, plus 40 lbs. nitrate of soda per acre	200 kilos of nitrate of soda.
"C" PLOTS ...	200 kilos sulphate of ammonia per acre	180 kilos sulphate of ammonia plus 180 kilos nitrate of soda per acre	200 kilos nitrate of soda per acre	60 lbs. sulphate of ammonia, plus 60 lbs. nitrate of soda per acre	300 kilos of nitrate of soda per acre.
DATE OF CUTTING :—	7.9.1931 ...	14.9.1931 ...	6.8.1931 ...	28.9.1931. ...	5 10.1931.

TABLE VI.

Results of Reaping of Manurial Experiments, 1930.

Estates	Beau Vallon S. E.	Labourdonnais S. E.	Rivière des Anguilles S. E.	Rose Belle S. E. (New Grove)	Savannah S. E.
Average yield of 10 control plots :—	19.10 tons of cane per acre.	16.31 tons of cane per acre.(a)	24.15 tons of cane per acre.(b)	19.67 tons of cane per acre.	21.82 tons of cane per acre.
Average difference of 3 "A" plots :—	-0.28±3.5 tons of cane per acre.	+0.98±1.2 tons of cane per acre.	23.59 tons of cane per acre.	-1.54±1.67 tons of cane per acre.	-0.15±2.43 tons of cane per acre.
Average difference of 3 "B" plots :—	+2.31±3.5 tons of cane per acre	+1.16±1.2 tons of cane per acre.	27.33 tons of cane per acre.	-0.61±1.67 tons of cane per acre.	-0.80±2.4 tons of cane per acre.
Average difference of 3 "C" plots :—	+0.88±3.5 tons of cane per acre.	+0.40±1.2 tons of cane per acre.	23.90 tons of cane per acre.	-1.37±1.67 tons of cane per acre.	+0.91±2.43 tons of cane per acre.

(a) In this experiment there were 13 control plots, and 4 plots in each series "A", "B" and "C".

(b) In this experiment, all the control plots were weighed together, so that it was impossible to work out the average difference between the experimental plots and the mean of the adjacent control plots. It was also impossible to work out the probable error.

TABLE VII.

NITRATE OF POTASH EXPERIMENT CONDUCTED AT
RIVIERE DES ANGUILLES S.E.

PLANTED ON 19TH AUGUST 1930—REAPED ON 18TH NOVEMBER 1931

		<i>Manures Applied</i>	
At planting		7 tons of fumier per arpent.	
30.12.1930		50 kilos precipitated phosphate per arpent.	
1. 1.1931		(17 tons of fumier per arpent, (50 kilos nitrate of soda per arpent.	
"A" plots received		50 kilos nitrate of potash per arpent.	
"B"	"	100	" "
"C"	"	150	" "
<i>Results</i>			
Average yield of 10 "S" plots		=	26.22 tons of cane per arpent.
Average difference of 3 "A" plots		=	+0.69±1.2 tons of cane per arpent.
Average difference of 3 "B" plots		=	+0.82±1.2 tons of cane per arpent.
Average difference of 3 "C" plots		=	-1.22±1.2 tons of cane per arpent.

14. VARIETY YIELD TRIALS.

Of the twelve variety yield trials started in 1930, nine were reaped during the crop season of 1931. Two of the remainder were too immature to be reaped, whilst the other had to be abandoned, on account of Phytalus and cyclone damage.

Seven of those reaped were only about twelve months old at the time of cutting i.e. "Petite Saison" canes. The other two were eighteen month crops or "Grande Saison." Little damage was caused to the "petite saison" canes by the cyclone as they were too small to be affected

As far as was possible the culture and manuring of these Variety Yield Trials were similar to that practised in the localities wherein they were situated, so that the results obtained are applicable to their particular regions. Five of these experiments were in Lower Savanne, and three in Pamplémousses, the remaining one being situated in Central Flacq.

The results of these experiments are given in metric tons of sugar per acre, as it is necessary to express them in a form which not only takes into account the field yields, but also the richness of the cane. In order to convert the sucrose % grs juice into sucrose o/o cane, a factor of 84% was used for all varieties.

The calculated results for these experiments are given in Tables VIII to XVI.

TABLE VIII.

VARIETY YIELD TRIAL No. 1 CONDUCTED AT St. AUBIN S.E.

PLANTED ON 26.2.1930—REAPED ON 23.9.1931

Average yield of 67 standard plots of White Tanna	=	4.12 tons of sugar per acre.
Average difference of 11 plots of BH. 10/12	=	+0.29±0.27 "
Average difference of 11 plots of R.P.6	=	+0.22±0.21 "
Average difference of 11 plots of R.P.8	=	0.00±0.23 "
Average difference of 11 plots of M.2316	=	+1.31±0.15 "
Average difference of 11 plots of M.2716	=	+0.73±0.18 "
Average difference of 11 plots of M.1221	=	-0.62±0.26 "

Conclusions.—M.2316 and M.2716 gave significantly better yields than White Tanna; and M.1221 a significantly worse yield.

TABLE IX

VARIETY YIELD TRIAL No. 2 CONDUCTED AT St. AUBIN S.E.

PLANTED ON 18TH OCTOBER 1930—REAPED ON 16TH NOVEMBER 1931

Average yield of 31 standard plots of White Tanna	=	1.63 tons of sugar per acre
Average difference of 5 plots of M.2716	=	+1.08±0.20 "
Average difference of 5 plots of M.1318	=	+2.43±0.21 "
Average difference of 5 plots of M.1718	=	+1.08±0.12 "
Average difference of 5 plots of M.3319	=	+0.89±0.12 "
Average difference of 5 plots of M.1520	=	+0.27±0.08 "
Average difference of 5 plots of M.2620	=	+0.92±0.12 "

Conclusions.—All the experimental varieties were significantly better than the standard, White Tanna. M.1318 gave the best yield followed by M.2716 and M. 1718.

TABLE X

VARIETY YIELD TRIAL No. 3, CONDUCTED AT ST. AUBIN S.E.

PLANTED ON 18TH OCTOBER 1930—REAPED ON 18TH NOVEMBER 1931

Average yield of 31 standard plots of White Tanna	=	0.95 tons of sugar per acre.
Average difference of 5 plots of M.1221	=	+1.20±0.15 "
Average difference of 5 plots of M.522	=	+0.80±0.11 "
Average difference of 5 plots of M.723	=	+1.83±0.10 "
Average difference of 5 plots of M.1025	=	+0.99±0.14 "
Average difference of 5 plots of M.1426	=	+2.04±0.21 "
Average difference of 5 plots of M.10926	=	+1.08±0.14 "

Conclusions.—All the experimental varieties were significantly better than the standard (White Tanna). M. 1426 gave the best yields, followed closely by M. 723.

TABLE XI

VARIETY YIELD TRIAL No. 1, CONDUCTED AT L'UNION S.E.
(RIVIÈRE DES ANGUILLES)

PLANTED ON 30TH OCTOBER 1930—REAPED ON 13TH OCTOBER 1931

Average yield of 26 standard plots of White Tanna	=	1.94 tons of sugar per acre.
Average difference of 5 plots of M. 117	=	+0.44±0.10 "
Average difference of 5 plots of M. 522	=	+1.33±0.10 "
Average difference of 5 plots of M. 723	=	+0.83±0.11 "
Average difference of 5 plots of M. 1025	=	+1.04±0.11 "
Average difference of 5 plots of M. 1221	=	+0.64±0.13 "

Conclusions.—All the experimental varieties were significantly better than the standard (White Tanna). M. 522, closely followed by M. 1025, gave the best results.

TABLE XII

VARIETY YIELD TRIAL No. 2, CONDUCTED AT L'UNION S.E.
(RIVIÈRE DES ANGUILLES)

PLANTED :—30TH OCTOBER 1930. REAPED :—13TH OCTOBER 1931

Average yield of 26 standard plots of White Tanna	=	1.69 tons of sugar per acre.
Average difference of 5 plots of M. 2716	=	+1.25±0.13 "
Average difference of 5 plots of M. 2916	=	+0.86±0.05 "
Average difference of 5 plots of M. 3422	=	+0.83±0.12 "
Average difference of 5 plots of M. 5726	=	+0.61±0.09 "
Average difference of 5 plots of BH. 10/12	=	+1.14±0.10 "

Conclusions.—All the experimental varieties were significantly better than the standard (White Tanna). M. 2716, closely followed by BH. 10/12, gave the best yields

TABLE XIII

SMALL SCALE YIELD TRIAL TO TEST P.O.J. 2878 AND WHITE TANNA,
CONDUCTED AT MON ROCHER S.E.

PLANTED :—21ST MARCH 1930. REAPED :—17TH SEPTEMBER 1931

Average yield of 5 standard plots of White Tanna	=	2.43 tons of sugar per acre.
Average difference of 4 plots of P.O.J. 2878	=	+1.25±0.31 "

Conclusions.—P. O. J. 2878 was significantly better than White Tanna.

TABLE XIV

VARIETY YIELD TRIAL No. 1, CONDUCTED AT MON ROCHER S.E.

PLANTED :—18TH OCTOBER 1930. REAPED ON 19TH NOVEMBER 1931

Average yield of 31 standard plots of D. 109	=	3.53 tons of sugar per acre
Average difference of 5 plots of M. 2716	=	-0.56±0.13 "
Average difference of 5 plots of M. 1318	=	-0.51±0.21 "
Average difference of 5 plots of M. 1718	=	-1.11±0.17 "
Average difference of 5 plots of M. 3319	=	-1.09±0.13 "
Average difference of 5 plots of M. 1520	=	-1.12±0.27 "
Average difference of 5 plots of M. 2620	=	-1.16±0.16 "

Conclusions.—All the varieties were significantly worse than the standard variety. (D. 109). The two varieties which show up best after the standard are M. 1318 and M. 2716.

TABLE XV.

VARIETY YIELD TRIAL No. 2, CONDUCTED AT MON ROCHER S.E.

PLANTED :—18TH OCTOBER 1930—REAPED :—23RD NOVEMBER 1931

Average yield of 31 standard plots of BH.10/12 = 2.77 tons of sugar per acre.

Average difference of 5 plots of M.1221 = - 0.42±0.10 "

Average difference of 5 plots of M.522 = 0.00±0.24 "

Average difference of 5 plots of M.723 = + 0.51±0.30 "

Average difference of 5 plots of M.1025 = - 0.41±0.15 "

Average difference of 5 plots of M.1426 = + 0.29±0.11 "

Average difference of 5 plots of M.10926 = + 0.23±0.17 "

Conclusions.—M. 1426 was significantly better than the standard variety BH.10 12 and the varieties M.1221 and M.1025 significantly worse. M.723 is the variety which actually gave the highest yield, but on account of the fact that the standard error is high, the results are not significant.

TABLE XVI.

VARIETY YIELD TRIAL CONDUCTED AT UNION S.E. (FLACQ)

PLANTED :—26TH SEPTEMBER 1930—REAPED :—7TH DECEMBER 1931

S. E. (meaning standard era).

Average yield of 4 lines of White Tanna = 2.43±0.33 tons of sugar per acre.

" Unité = 2.69±0.31 "

" White Tanna } = 2.54±0.34 "

" St. Aubin } "

" R.P.6 = 3.74±0.29 "

" M.524 = 2.65±0.17 "

" R.P.8 = 2.83±0.38 "

" M.4726 = 2.79±0.29 "

" P.O.J.213 = 4.51±0.45 "

" M.2316 = 2.81±0.61 "

" Co. 213 = 4.14±0.36 "

" BH.10/12 = 3.41±0.64 "

" 55/1182 = 3.21±0.35 "

" M 1818 = 4.01±0.93 "

" M.2716 = 2.23±0.22 "

REMARKS.—This experiment was laid down on a different plan from the remainder, in that there were the same number of rows of the standard variety (White Tanna) as of the varieties under test, of which there were fourteen. One of these, M.117, was not reaped as there were very few stools remaining. Consequently the average yield per row for each variety has been calculated, together with the standard deviation. On the results obtained, the varieties P.O.J. 213; Co. 213 and R.P. 6 (in order of merit) are significantly better than White Tanna, whilst M.1818; BH.10/12 and 55/1182 are better, but not significantly so, the increase in yield compared with that of the White Tanna being only 11.5 times the standard error.

GENERAL CONCLUSIONS.—Judging from the results obtained from Trials Nos. 2 and 3 at St. Aubin S.E. and from Trials Nos. 1 and 2 at Union S.E. (Rivière des Anguilles), it would seem that the White Tanna variety is not suitable for planting in "Petite Saison", as apparently its early growth lacks the vigour of the seedling canes which have been grown with it. This is clearly indicated by the fact that in every case in these experiments the experimental varieties have given a significantly higher yield of sugar per acre. In the one yield trial with a growing period of eighteen months, the White Tanna shows up much better, only two of the six experimental varieties being significantly better and one being significantly worse.

It is unfortunate that M. 2316 was only tried in one of these experiments, namely St. Aubin S.E. No. 1. In this experiment, however, it came out top easily, and judging from this and its previous record, it would seem to be a cane of outstanding merit.

Of the remainder those which have done consistently better than the others are as follows :—M. 2716; M.1318; M.723; M.1426 and BH.10/12. P.O.J.213 and Co.213 both of which had only one trial, i.e. that at Union S.E. (Flacq), came out very well.

All the results so far obtained in these trials are with virgin canes only and consequently no definite recommendations can be made until such time as the results of a series of ratoon crops are known.

15. VARIETY YIELD TRIALS, 1931.

The yield trials which were reaped during the current year will be continued in 1932 to determine the behaviour of the seedlings in first ratoons. A variety yield trial at each of the Experiment Stations has been laid down to test the two Java seedlings P.O.J. 2725 and P.O.J. 2878 against standard canes. In addition to these, similar trials have been established on three estates in widely different localities.

The geographical positions of these trials are shown on Map I.

16. X—RAY WORK.

1930 X—RAYED SEEDLINGS.—Many of the seedlings which were x-rayed in 1930 were unfortunately planted out on the day before the cyclone in March 1931, with the result that many died as a result of being buried by the soil which was washed into the holes. However, 174 remained and these were planted in alternate rows, with untreated seedlings of the same cross planted in the remaining rows. So far as can be seen at present no mutant form has been produced.

1931 PROGRAMME.—The experiment was repeated during the 1931 crossing season, but in this year's experiments much younger seedlings were employed, and very much heavier doses were given. This work was only rendered possible by the courtesy of the Director of the Medical and Health Department, and by the ready help of Dr Mollières, the Radiologist.

The details of these experiments are given in Table XVII.

TABLE XVII.

Date	Cross No.	Age of Seedlings	Target Distance	Tube Current	Potential	Time of Exposure
6.10.31	254	6 days	33 cms	3 m/amp	89,000 volts	15 mins
9.10.31	260	11 days	19 cms	3 m/amp	109,000 volts	15 mins
13.10.31	298	13 days	19 cms	3 m/amp	106,000 volts	25 mins

A short time after irradiation, some of the treated seedlings, especially in Cross No. 298, i.e. those which received the maximum exposure, showed chlorotic patches upon the leaves, and their growth was also slightly retarded. Later however the plants recovered, and grew normally. Before they were ready for being planted out, these seedlings were attacked by aphids and it seemed that the attack was more severe on the treated seedlings than on the non-treated ones. Consequently there was a high mortality amongst the x-rayed seedlings when they were potted.

Fuzz was also treated with 1% Methylene blue solution to sensitize it to the action of ultra-violet rays, with the object of testing the effect of ultra-violet rays, but unfortunately the apparatus was not available at the time, so that it was impossible to carry on with the experiment. The treated and non-treated fuzz was sown separately, equal germination being obtained in each case, so that it may be concluded that methylene blue has no ill-effect upon germination.

17. POLLEN EXAMINATION DURING THE CROSSING SEASON OF 1931.

Pollen tests were carried out during the arrowing season, but not on the same scale as during the previous season. In general the results of this year have confirmed those of the previous one.

The most important points noticed with regard to the different varieties were:—(i) The advisability of considering each individual arrow on its merits as arrows of the same variety grown in close proximity may have totally different characteristics; (ii) Varieties with yellow anthers may with safety be used as female parents as in no case did a variety with anthers of this colour give fertile pollen; (iii) In general it was found that varieties with red or purple anthers were the best for giving fertile pollen, although in certain cases, brown anthers were equally good.

18. EXPERIMENTS WITH VARIOUS MEDIA.

In the examination of cane stigmas it was found that there was quite a large amount of water-soluble phosphorus and potash present in them, and on these results it was decided to try the effect of the addition of potassium di-hydrogen phosphate to the sucrose-agar media as a possible method for increasing the germination. The amount added at the start was 0.5%, but later it was tried when only 0.1% was added. In all cases the pH of the media was adjusted by the addition of N/10 potassium hydroxide solution, so that the pH of this experimental medium was the same as that of the standard.

This experiment was performed with pollen which gave good results on the standard sucrose-agar medium, that from M. 3726 and Uba Marot being used. Two slides were prepared with each medium. The results obtained are given in Table XVIII.

TABLE XVIII.

POLLEN GERMINATION TESTS WITH MEDIA CONTAINING POTASSIUM DI-HYDROGEN PHOSPHATE.

Variety	Germination			
	26% sucrose agar	26% sucrose agar plus 0.5% KH_2PO_4	26% sucrose agar plus 0.2% KH_2PO_4	26% sucrose agar plus 0.1% KH_2PO_4
M. 3726 ...	12.1%	0%	...	...
Sorghum ...	few	0%	...	...
M. 3726 ...	14.3%	0.6%	few	few
Uba Marot ...	25.0%	...	...	5%

It would appear, however, that the addition of potassium di-hydrogen phosphate prevents the formation of pollen tubes, but it must be observed that in those cultures containing this substance, many of the pollen grains burst. In view of these results, it was not considered advisable to carry on further experiments with this substance, but the effect of adding Taka diastase to the medium was tried.

The media was prepared in the normal way, and when it had partially cooled, 0.1% Taka diastase was added and well mixed. In this case the cultures were generally prepared in duplicate but sometimes in quadruplicate. From present indications there is little to choose between the two media. The results are given in Table XIX.

TABLE XIX.

Variety	Standard Medium		S. M. plus 0.1% Taka diastase	
M. 10926	...	5.3%	...	7.4%
Senneville	4% tubes —	4% burst	0% tubes —	16% burst
M. 1318	1% " —	6% "	5% " —	11% "
B. 6450	<1% " —	<1% "	<1% " —	<1% "
M. 323	Nil		Nil	
M. 10926	...	both	equal	
Uba Marot	10% tubes —	41% burst	25% tubes —	29% burst
M. 1318	few " —	some "	few " —	some "
Senneville	" —	"	" —	"
M. 323	" —	"	" —	"
Uba Marot	23% tubes		16% tubes	

A medium made up of starch with Taka diastase was also tried, but no germination was seen.

19. POLLEN STORAGE EXPERIMENTS.

Several experiments were conducted, but in all except two cases the pollen which was sown on the sucrose-agar medium immediately after arrival at the laboratory failed to germinate and therefore it was useless to carry on with the test.

In the first experiment, Uba Marot arrows were used. Some pollen was collected immediately and sown on the standard medium. The portions of the arrows with open flowers was then broken into small pieces and well mixed. The fuzz was then divided into three portions, each of which was stored in an airtight container with a layer of wet cotton at the bottom, so that the atmosphere inside would have a Relative Humidity of 100%. At intervals of approximately 3 hours, a tin was opened, the fuzz was spread in a thin layer for a short time to dry, and then the pollen was collected and sown in the usual manner. The results obtained are as follows:—

Time of Sowing		Germination	
7 a.m.	...	...	23%
10 a.m.	...	...	23%
2.25 p.m.	...	...	15%
4.20 p.m.	...	...	20%

In these conditions therefore it would appear that pollen may be stored for nine to ten hours without any appreciable loss of germinating power.

The second experiment was carried out in a similar manner, except that five lots were prepared. Moreover at the start of the experiment, much pollen was collected and divided into 5 lots and placed in small specimen tubes, one of each being placed in each air-tight container. The results are given in Table XX.

TABLE XX.

Time of Sowing			Germination	
			From Fuzz	From Tube
First day	9.40 a.m.	...	16%	...
	1.25 p.m.	...	15%	5%
	5.25 p.m.	...	14%	2%
	9.15 p.m.	...	18%	6%
Second day	9.40 a.m.	...	3%	0%
	11.00 a.m.	...	1%	0%

It is thus seen that it is much better to keep the pollen in the fuzz than to separate it first, and afterwards store in glass tubes. For a period of 12 hours, there seems to be no loss at all of germinating power when the pollen remains in the fuzz in a saturated atmosphere in the dark. Even 24 hours after the first sowing, there is still fair germination but then within another two hours, it has fallen to practically nothing.

The effect of storing pollen in an atmosphere of nitrogen and carbon dioxide saturated with water vapour was also tried with pollen from the variety *Petite Senneville*. At the start 12% of the grains germinated in the standard media and after 24 hours storage, only 3% germinated. Subsequent sowings failed to show any germination.

The Coimbatore Method of storage was also tried. Arrows of two varieties which were just starting to open flowers were cut with about 7 feet of cane, and the cut ends were placed in puddled clay. All open flowers were removed and the leaves were trimmed to reduce evaporation. The arrows were wrapped in several layers of paper and were kept in the shade, water being sprinkled on them occasionally. After three days, when the leaves had dried, the arrows were removed and dried, but as no new flowers had opened, no pollen could be obtained.

An interesting point was noticed when pollen, especially that of *Uba Marot*, was being examined by means of the iodine test. It was seen that all the starch granules, which were stained blue, were concentrated in one-half of the pollen grain. This phenomenon cannot be explained but it should be remarked that *Uba Marot* pollen is amongst the most fertile examined in Mauritius, and that crosses of this variety with P.O.J. 213 and with P.O.J. 2878 have given many more seedlings than crosses of noble cane varieties with these P.O.J. canes.

20.—ROOTING EXPERIMENTS.

Experiments were carried out with the object of finding an improved technique for the isolation of rooted canes. The experiments were originally started in February, but on account of the cyclone all the first series were destroyed, so that it was necessary to restart them at the end of March, by which time the canes had partially recovered. The investigation may be divided into two parts; first the most suitable mixture with which to make the "layer", and second, the best method of severance after roots had been produced. It was not possible to choose canes which would arrow at this season of the year, and the two varieties used for the experiment, R.P.6 and R.P.8., did not flower at all at the Central Experiment Station. Thus no information was obtained from this work as to the effect upon the arrow—an important point—as it was noticed both during 1930 and 1931 that after severance, the protrusion of the arrow did not take place normally, although the severed cane did not apparently suffer much of a check immediately following severance.

The actual rooting mixtures tried are given below in the order in which the roots appeared, and the time taken for the appearance of the roots is also shown.

Coir and dung with funnel	...	...	...	...	10 days
Coir and dung with hole bored below the nodes	...	...	...	...	12 "
Coir and clay	...	...	...	...	12 "
Sphagnum moss and dung	...	...	...	...	15 "
Soil in basket	...	...	...	...	16 "
Coir and dung	...	...	...	...	19 "
Soil and fumiér in basket	...	...	...	...	20 "

The object of the funnel in the first method is to keep the mixture constantly moist. From these results it would appear that the best mixture to be used are coir and dung or coir and clay mixtures. The coir and dung mixtures with funnel or with holes also stood the shock of severance better than did the others.

The different methods of severance tried were:—(1) one cut; (2) two cuts with an interval of three or four days; and (3) gradual severance. A smaller proportion of the canes severed by method (1) wilted than did those by the other two methods, which were about equal. The results cannot be considered conclusive however, and it seems possible that the determining factor with regard to wilting after severance is the production of abundant roots from the root bands.

A method which was only tried on a small scale, but which gave encouraging results, is a combination of the rooting method of isolation and that of isolation in 0.03% Sulphur dioxide solution. In this the cane is rooted, and when abundant roots have been produced, the cane is cut at ground level, the cut end being placed in the Sulphur dioxide solution. This enables the cane to withstand the shock of severance and after a period of about one week the Sulphur dioxide solution may be removed.

During the crossing season about 150 layers were made, but in many cases the canes either failed to produce roots before the arrow was produced, or else no arrow was produced at all. Consequently in all only about 70 of these layers were actually severed in the field, of these 31 were rooted arrows of the several *Glagah* varieties, 23 producing normal arrows which could be employed for crossing work as male parents, but of the 37 layers of noble canes only 17 gave normal arrows, which were used with encouraging results as previously noted.

21. CANE GROWTH MEASUREMENTS.

The cane growth measurements for the year 1929–1930 have now been completed and during the whole period records have been kept of (a) Temperature; (b) Rainfall; (c) Soil Moisture; (d) Evaporation (by means of Livingstone Atmometers); (e) Wind Velocity.

No attempt has been made to analyse the figures so obtained on a mathematical basis, as it is considered that before any such attempt is made several such series of figures should be available. Furthermore, the canes measured in this series suffered rather badly from the March cyclone, and in view of this very serious disturbing factor, it is more than probable that the measurements made subsequently are not at all comparable with those of a normal year.

The measurements were conducted on each cane of 5 stools of each of the varieties White Tanna and P.O.J.2878 at both the Central Experiment Station and Pamplémousses Experiment Station. In general it may be stated that at both stations, the Java cane grew much more vigorously than did the White Tanna, the former growing on an average 3.3 cms per week more than the latter, for the period from the beginning of January to the March cyclone. In the five weeks after the cyclone, the average rate of growth was very low, due to two reasons; first the mechanical damage caused by the cyclone and second due to the dry weather, which resulted in the soil moisture falling to under 25% on oven dry soil at Pamplémousses Experiment Station and to about 30% at Central Experiment Station. From the cyclone up to crop time the rate of growth of P.O.J.2878 remained fairly consistently above that of the White Tanna.

The peak of the growth rate curve at Pamplémousses Experiment Station occurred in February 2, which was also the maximum average weekly temperature recorded. At this time the soil moisture was also near its maximum, so that the canes had the optimum conditions for growth which amounted to 14 cms per week for P.O.J.2878 and 11.2 cms for White Tanna.

At the Central Experiment Station, the periods of maximum growth for the two varieties occurred at different dates, possibly on account of the different ages of the cane.

That for White Tanna was in the first week of January whereas for P.O.J.2878 it was in the week ending February 2, the growth being 7 cms and 11 cms per week respectively.

From a consideration of the growth curves for the two stations, it would seem that the general form of the curve is a function of the temperature, but that fairly considerable variations are caused by changes in soil moisture conditions.

It is doubtful whether any close correlation between growth and total rainfall could be determined, as in the case of heavy precipitations only a part is effective in that it brings the soil to its maximum moisture content. The surplus to this effective rainfall may even have a depressing effect upon growth due to the leaching of plant food from the soil.

An attempt to determine the actual temperature effect is being made during the present series of growth rate measurements, which are being carried out with virgin canes and first ratoon canes following the routine followed up to the present. A further batch of 5 stools of P.O.J.2878 has been chosen for taking these measurements, but with these the soil is being kept near its maximum water content by means of liberal waterings three times a week. By this means it is hoped to eliminate the soil moisture effect, so that the temperature effect may be accurately determined.

TABLE XXI.

LIST OF CROSSES MADE DURING SEASON 1931

I.—CROSSES BETWEEN "NOBLE CANES"

Combination	Location of cross	No. of arrows sown	No. of seedlings obtained	No. of seedlings potted at:—	
				C.E.S.	P.E.S.
B. 3390 × M. 3517	Béga	3	98	98	...
B. 3390 × Senneville	do	1	12	11	...
M. 55 × M. 2416	do	1	5	5	...
M. 131 × M. 2316	do	3	90	86	...
M. 131 × M. 2716	do	2	262	243	...
M. 131 × M. 3517	do	3	896	611	...
M. 131 × Senneville	do	3	289	280	...
M. 131 × D. K. 74	do	3	1,179	674	193
M. 131 × D. K. 74	P.E.S.	1	0	...	...
M. 131 × M. 2316	do	2	436	...	261
M. 131 × M. 5019	do	1	270	...	166
M. 131 × M. 2620	do	1	6	...	4
M. 131 × Senneville	do	2	377	...	151
M. 131 × Str. D. 109	do	1	246	...	150
M. 131 × White D. 109	do	2	137	...	92
M. 131 × M. 86/04	do	1	180	...	89
M. 55/74 × M. 2716	C.E.S.	2	28	25	...
M. 55/74 × M. 3517	do	3	2,876	815	...
M. 55/74 × M. 1318	do	1	42	38	...
M. 55/74 × M. 519	do	1	21	20	...

TABLE XXI.—(Continued)

LIST OF CROSSES MADE DURING SEASON 1931—(Contd.)

Combination	Location of cross	No. of arrows sown	No. of seedlings obtained	No. of seedlings potted at:—	
				C.E.S.	P.E.S.
M. 55/74 × M. 1520	C.E.S.	1	251	182	...
M. 55/74 × M. 1821	do	1	60	55	...
M. 55/74 × M. 3222	do	1	52	52	...
M. 55/74 × Senneville	do	1	21	21	...
M. 55/74 × D. K. 74/70	do	1	561	492	...
M. 55/74 × D. K. 74 (green stripe)	do	1	0	...	...
M. 55/74 × D. K. 74	do	1	313	179	...
M. 55/453 × D. K. 74/70	do	2	0	...	...
M. 1116 × White D. 109	P.E.S.	1	25	...	17
M. 1216 × M. 3517	Béga	3	965	450	...
M. 1316 × D. K. 74/70	C.E.S.	1	239	212	...
M. 1516 × M. 3517	Béga	1	19	19	...
M. 1516 × Senneville	do	1	0	...	...
M. 2016 × M. 2316	do	1	110	100	...
M. 2016 × M. 2416	do	1	18	18	...
M. 2016 × M. 3517	do	3	4,366	670	427
M. 2016 × Senneville	do	1	400	359	...
M. 2016 × D. K. 74	do	1	766	224	...
M. 2316 × M. 2716	do	3	4	4	...
M. 2316 × M. 3517	do	5	190	168	...
M. 2316 × Senneville	do	1	0	...	...
M. 2316 × D. K. 74	do	1	0	...	...
M. 2316 × Senneville	C.E.S.	1	19	17	...
M. 2316 × M. 3517	do	1	26	24	...
M. 2316 × M. 519	do	1	8	8	...
M. 117 × M. 2716	Béga	1	1,174	500	263
M. 117 × M. 3517	do	1	113	98	...
M. 3319 × M. 131	P.E.S.	1	300	...	159
M. 3319 × M. 424	do	1	150	...	104
M. 3319 × M. 2316	do	1	550	...	336
M. 3319 × M. 2425	do	2	2,555	...	308
M. 3319 × Senneville	do	2	4,825	...	330
M. 3319 × Str. D. 109	do	1	1,500	...	391
M. 3319 × White D. 109	do	1	1,500	...	326
M. 3319 × M. 2716	C.E.S.	1	1	...	...
M. 3319 × M. 2916	do	1	0	...	...
M. 3319 × M. 3517	C.E.S.	1	129	115	...
M. 3319 × M. 1318	do	1	230	221	...
M. 3319 × M. 1520	do	1	9	9	...
M. 3319 × M. 3826	do	1	46	44	...
M. 3319 × Senneville	do	2	799	481	...
M. 3319 × D. 109	do	1	240	230	...
M. 2620 × D. K. 74	P.E.S.	1	480	...	224
M. 2620 × Senneville	do	1	5	...	4
M. 2620 × Senneville	C.E.S.	1	1	...	...
M. 2820 × M. 5019	P.E.S.	1	1	...	1
M. 2820 × Senneville	do	1	0	...	0
M. 321 × M. 3517	C.E.S.	1	96	46	...
M. 422 × M. 3517	do	1	1,112	300	...
M. 422 × M. 323	do	1	196	169	...
M. 1022 × M. 3517	Béga	2	1,569	276	...
M. 1022 × M. 1318	do	1	76	65	...
M. 1022 × M. 131	P.E.S.	1	0	...	0
M. 1022 × M. 5019	do	1	800	...	373
M. 1022 × Senneville	do	1	1,168	...	356
M. 1022 × Str. D. 109	do	1	0	...	0
M. 2522 × M. 1821	C.E.S.	1	7	7	...
M. 2522 × D. K. 74	do	1	655	275	180
M. 3222 × M. 2716	Béga	1	0	...	...
M. 823 × M. 2916	C.E.S.	1	36	29	...
M. 823 × M. 1821	do	1	41	40	...
M. 1224 × M. 131	P.E.S.	1	326	...	279
M. 1524 × M. 5019	do	1	0	...	0
M. 1524 × M. 86/04	do	1	48	...	34
M. 1624 × M. 5019	do	1	0	...	0
M. 1624 × M. 2620	do	1	1	...	1
M. 1624 × M. 2425	do	1	0	...	0
M. 1624 × White D. 109	do	1	0	...	0
M. 2425 × M. 2416	C.E.S.	1	0	...	...
M. 2425 × M. 3517	do	2	415	348	...
M. 2425 × M. 1318	do	1	498	300	...
M. 2425 × M. 323	do	1	1	1	...
M. 2425 × D. K. 74 (Gde Rosalie)	do	1	653	275	192

TABLE XXI.—(Continued)

LIST OF CROSSES MADE DURING SEASON 1931—(Contd.)

Combination	Location of Cross	No. of arrows sown	No. of seedlings obtained	No. of seedlings potted at:—	
				C.E.S.	P.E.S.
M. 726 × M. 2316	P.E.S.	1	2,328	...	300
M. 5526 × D. K. 74	do	1	55	...	43
M. 5526 × M. 2316	do	1	0	...	...
M. 10926 × M. 3517	C.E.S.	1	493	316	...
M. 10926 × M. 1318	do	1	478	244	...
M. 10926 × D. K. 74/70	do	1	1,561	543	...
M. 121/26 × M. 2716	do	1	23	21	...
M. 121/26 × M. 3517	do	1	1	1	...
M. 121/26 × D. K. 74/70	do	1	0	...	...
M. 14726 × M. 5019	P.E.S.	1	0	...	...
M. 14726 × Str. D. 109	do	1	52	...	44
M. 15826 × White D. 109	do	1	0	...	0
Rose } × M. 131 P	do	1	0	...	0
Bambou }	do	1	0	...	0
do × M. 5019	do	1	2	...	1
R.P. 6 × M. 2416	Béga	1	126	110	...
R.P. 6 × M. 2716	do	5	1,718	703	277
R.P. 6 × M. 3517	do	3	1,453	679	512
R.P. 6 × M. 1318	do	1	131	115	...
R.P. 6 × Senneville	do	1	0	...	...
R.P. 6 × D.K. 74	do	3	50	50	...
Total	...	154	46,696	12,766	6,588

II.—INTER-SPECIFIC CROSSES

I.—1ST NOBILISED GLAGAH

M. 3319 × G. Tabango	C.E.S.	1	0	...	...
M. 1524 × G. Tabango	P.E.S.	1	0	...	0
M. 1022 × G. Djatiroto	do	1	38	...	24
M. 2620 × G. Djatiroto	do	2	0	...	0
M. 5526 × G. Tabango	do	1	21	...	18
M. 3726 × G. Tabango	C.E.S.	1	9	9	...
M. 3826 × G. Tabango	do	1	4	3	...
M. 131 × G. Kletak	Béga	1	1,041	160	108
M. 131 × G. Tabango	do	1	1,036	276	100
M. 2016 × G. Kepandgen	do	1	827	190	100
M. 2016 × G. Djatiroto	do	1	9	9	...
M. 117 × G. Tabango	do	1	200	139	23
M. 117 × G. Djatiroto	do	1	216	195	...
Total	...	14	3,401	981	373

II.—2ND NOBILISED GLAGAH

Seedling No. 3530 P.E.S. × White D. 109	P.E.S.	1	3	...	3
M. 1516 × Seedling No. 371/30 C.E.S.	C.E.S.	1	0	...	...
M. 2016 × Seedling No. 361/30 C.E.S.	Béga	1	1	1	...
R. P. 6 × Seedling No. 255/30 C.E.S.	do	1	675	343	171
R. P. 6 × Seedling No. 337/30 C.E.S.	do	1	0	...	...
Total	...	5	679	344	174

III.—4TH NOBILISED GLAGAH

P.O.J. 2878 × D.K. 74	Béga	3	78	65	...
do × Senneville	do	4	366	242	122
do × M. 2316	do	1	21	21	...
do × M. 2416	do	1	4	4	...
do × M. 2716	do	4	80	66	...
do × M. 3517	do	4	230	201	...
do × D. K. 74/70	C.E.S.	3	91	46	43
do × L. B. 111/14	do	2	8	8	...
do × M. 3517	do	2	231	221	...
do × M. 323	do	2	16	16	...
do × M. 3726	do	5	101	84	...
do × M. 3826	do	2	...	...	...
do × M. 10926	do	1	143	110	...
do × D. K. 74	P.E.S.	2	37	...	31
do × D. 109	do	1	50	...	39
do × 131 P.	do	2	0	...	0
do × M. 2316	do	2	120	...	94
do × Senneville	do	1	17	...	15
do × Str. D. 109	do	1	0	...	0
do × White D. 109	do	1	80	...	63
Total	...	44	1,673	1,090	407

TABLE XXI.—(Continued)

LIST OF CROSSES MADE DURING SEASON 1931.—(Contd.)

II.—INTER-SPECIFIC CROSSES (Contd.)

Combination				Location of cross	No. of arrows sown	No. of seedlings obtained	No. of seedlings potted at:—	
							C. E. S.	P. E. S.
IV.—CHUNNEE CROSSES								
M. 131	× Co. 213	...	...	Béga	5	3,438	951	...
M. 131	× Co. 213	...	...	P.E.S.	1	312	...	227
M. 2016	× Co. 213	...	...	Béga	3	236	133	39
M. 2316	× Co. 213	...	...	do	2	1	1	...
M. 117	× Co. 213	...	...	do	1	7	7	...
P.O.J. 213	× Canne Antelme	...	...	do	1	0	...	...
do	× Hache paille	...	...	do	1	2	2	...
do	× D. K. 74	...	...	do	2	1	1	...
do	× Senneville	...	...	do	1	7	7	...
do	× M. 2316	...	...	do	5	23	23	...
do	× M. 2716	...	...	do	3	1	1	...
do	× M. 3517	...	...	do	4	82	80	...
do	× Co. 213	...	...	do	2	0	...	...
M 1516	× Co. 213	...	...	C.E.S.	1	0	...	...
M. 2620	× Co. 213	...	...	do	1	133	86	...
M. 321	× Co. 213	...	...	do	1	273	188	...
P. O. J. 213	× M. 2620	...	...	do	1	1	1	...
do	× M. 323	...	...	do	1	0	...	...
do	× M. 3726	...	...	do	1	4	4	...
do	× D.K. 74/70	...	...	do	1	0	...	...
do	× D.K. 74	...	...	P.E.S.	1	8	...	5
do	× M. 87	...	...	do	1	66	...	55
do	× M. 5019	...	...	do	1	0	...	0
do	× M. 2620	...	...	do	1	1	...	...
do	× M. 1821	...	...	do	1	4	...	3
do	× M. 3826	...	...	do	1	4	...	3
do	× Senneville	...	...	do	1	7	...	5
do	× Str. D. 109	...	...	do	1	16	...	14
M. 1022	× Co. 213	...	...	do	1	1	...	0
M. 1524	× Co. 213	...	...	do	1	800	...	300
M. 5526	× Co. 213	...	...	do	1	0	...	...
M. 131	× Co. 213	...	...	do	1	312	...	...
Total					50	5,740	1,485	652
V.—SINENSE CROSSES								
A. 425/29	× Senneville	...	...	P.E.S.	1	5	...	4
A. 710/29	× M. 131	...	...	do	1	0	...	0
B. 100/29	× Senneville	...	...	do	1	11	...	11
Brown Sport } Uba Seedling }	× D.K. 74	...	...	do	1	3	...	2
do	× M. 131	...	...	do	2	9	...	7
do	× M. 5019	...	...	do	2	370	...	265
do	× M. 1821	...	...	do	1	11	...	11
do	× M. 323	...	...	do	1	5	...	3
do	× M. 2425	...	...	do	1	3	...	2
do	× M. 86/04	...	...	do	1	2	...	1
do	× Str. D. 109	...	...	do	1	1	...	1
do	× Senneville	...	...	C.E.S.	1	1	1	...
M. 3319	× Uba R. Fund No. 1	...	...	P.E.S.	1	575	...	246
M. 1020	× Uba Marot	...	...	do	1	50	...	34
M. 1022	× Uba Marot	...	...	do	1	44	...	25
M. 1022	× Uba R. Fund No. 1	...	...	do	1	3	...	1
M. 5526	× B. 984/29	...	...	do	1	70	...	51
M. 2425	× Antelme	...	...	C.E.S.	1	1	1	...
M. 55/74	× Antelme	...	...	do	1	91	86	...
Uba Rayée	× M. 3517	...	...	do	2	103	55	...
Uba Rayée	× M. 3222	...	...	do	1	0	...	...
Uba Seedlg.	× M. 323	...	...	do	4	2	2	...
do	× M. 3726	...	...	do	1	0	...	...
do	× M. 131	...	...	P.E.S.	2	6	...	4
do	× M. 5019	...	...	do	1	75	...	41
do	× Senneville	...	...	do	1	10	...	9
Uba	× M. 1821	...	...	do	1	0	...	0
R. P. 6	× Uba Marot	...	...	C.E.S.	2	0	...	...
M. 131	× Uba Marot	...	...	Béga	3	2,570	745	...
M. 2016	× Uba Marot	...	...	do	2	112	96	...
M. 2316	× Uba Marot	...	...	do	1	1	1	...
M. 117	× Uba Marot	...	...	do	1	14	14	...
Total					43	4,148	1,001	718

TABLE XXI.—(Continued)
LIST OF CROSSES MADE DURING SEASON 1931.—(Contd.)
II.—INTER-SPECIFIC CROSSES—(Contd.)

Combination		Location of cross	No. of arrows sown	No. of seedlings obtained	No. of seedlings potted at		
					C.E.S.	P.E.S.	
VI.—OTHER CROSSES							
P.O.J. 2878	* Uba Marot	...	Béga	4	2,423	592	...
P.O.J. 2878	* Uba Marot	...	C.E.S.	2	0	...	...
P.O.J. 2878	* Uba Marot	...	P.E.S.	1	3,250	...	400
55/74	* Sinnombre	...	do	1	3	...	3
P.O. J. x 2	* Senneville	...	do	1	22	...	12
Total		...		9	5,698	592	415
VII.—SORGHO CROSSES							
M. 1516	* Honey Sorgho	...	C.E.S.	1	0	0	...
M. 3319	* Sorgho ?	...	do	1	4	4	...
M. 3319	* Honey Sorgho	...	do	1	0	0	...
M. 2620	* Sorgho Atlas	...	P.E.S.	1	0	...	0
M. 1022	* Sorgho Honey	...	do	1	0	...	0
M. 55/26	* Sorgho Honey	...	do	1	0	...	0
Sorgho vulgare	* M. 1821	...	do	1	0	...	0
Total		...		7	4	4	0
FUZZ FROM HAWAII.—							
Yellow Caledonia x H. 109		...	Hawaii	4	12*	0	0

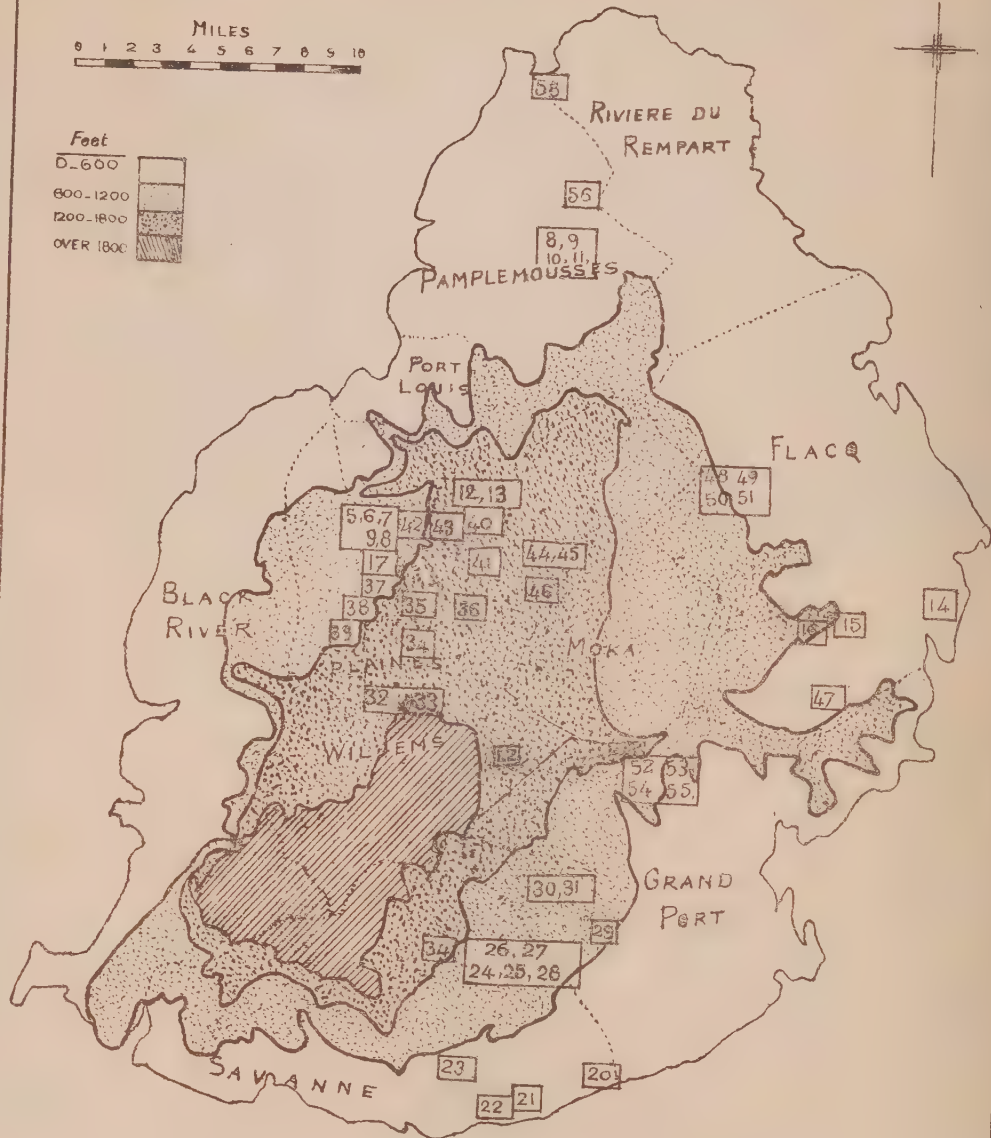
III. SELFINGS

Variety	Location	No. of arrows sown	No. of seedlings obtained	No. of seedlings potted at	
				C.E.S.	P.E.S.
M. 131	Béga	1	0	0	...
M. 131	Mon Rocher	1	0	...	0
M. 2016	Béga	1	0	...	...
M. 2316	do	2	0	0	...
M. 2316	P.E.S.	1	0	...	0
M. 2416	Béga	1	1	1	...
M. 2716	do	2	34	34	...
M. 117	do	1	0	0	...
M. 3517	do	1	0	0	...
M. 519	P.E.S.	1	37	...	28
M. 3319	do	1	5	...	5
M. 2820	do	1	0	...	0
M. 1022	do	1	0	...	0
M. 323	do	1	0	...	0
M. 1224	do	1	0	...	0
M. 3326	do	1	0	...	0
M. 5526	do	1	50	...	29
Brown Sport Uba Seedling	do	1	37	...	26
D K. 74	do	1	13	...	0
D. 109	do	1	2,570	...	304
Rose Bambou	do	1	0	...	0
R. P. 6	Ebène	1	0	0	...
P. O. J. 2878	do	2	10	10	...
P. O. J. 2878	C.E.S.	2	1	1	...
Uba seedling	P.E.S.	1	0	...	0
Total		29	2,758	46	392

IV. UNCONTROLLED POLLINATIONS

M. 55	d'Epinay	5	6	...	5
M. 131	Béga	2	0	0	...
M. 131	St. Aubin	12	38	34	...
M. 131	Mon Rocher	2	4	...	3
M. 2316	Béga	1	0	0	...
M. 2316	St. Aubin	10	0	0	...
M. 2316	Mn. Blanche	5	0	...	0
M. 2716	C.E.S.	1	8	8	...
M. 2916	Ebène	1	0	0	...
M. 3517	Béga	1	0	0	...
M. 1318	C.E.S.	1	0	0	...
M. 219	Rich Fund	2	20	20	...
M. 3319	P.E.S.	1	7	...	7
M. 1520	C.E.S.	3	28	27	...

*These seedlings died shortly after they germinated



2. Location of Soil Samples.

TABLE XXI.—(*Continued*)LIST OF CROSSES MADE DURING SEASON 1931.—(*Contd.*)IV. UNCONTROLLED POLLINATIONS.—(*Contd.*)

Variety	Location	No. of arrows sown	No. of seedlings obtained	No. of seedlings potted at	
				C.E.S.	P.E.S.
M. 2620	St. Aubin	9	167	107	...
M. 2620	C.E.S.	2	1	1	...
M. 522	St. Aubin	1	7	7	...
M. 1821	Rich Fund	4	3	3	...
M. 1522	St. Aubin	4	24	19	...
M. 1922	do	5	207	101	...
M. 2122	do	1	0	0	...
M. 323	do	9	477	125	...
M. 10926	Rich Fund	1	13	0	...
M. 10926	C.E.S.	3	80	79	...
D. K. 74	Rich Fund	8	226	93	...
D. K. 74	d'Epinay	11	67	0	0
Louzier	Australia	3	1	...	1
R. P. 6	Ebène	1	0	0	...
R. P. 6	California	22	299	...	238
Senneville	Mon Rocher	3	0	...	0
White Tanna	St. Aubin	4	0	0	...
White Tanna	Mon Songe	174	0	...	0
R. F. No. 1	Rich Fund	1	3	3	...
R. F. No. 2	do	3	22	5	...
R. F. No. 2	St. Aubin	19	273	241	...
R. F. No. 4	Rich Fund	7	0	0	...
Uba Seedling	do	2	0	0	...
Uba Seedling	Mon Rocher	1	6	...	5
Brown Sport Uba Seedling	C.E.S.	1	0	0	...
P. O. J. × 2	St. Aubin	13	7	6	...
P. O. J. 2878	C.E.S.	5	96	68	28
P. O. J. 213	Béga	1	0	0	...
P. O. J. 213	St. Aubin	5	1	1	...
Total	..	370	2,091	948	287
Grand Total	...	729	72,900*	19,257	10,006

* Including the twelve seedlings from the fuzz from Hawaii.

PART II

BIOCHEMICAL DIVISION.

As previously reported, the only officer continuously engaged on soil investigational work was my Scientific Assistant. In consequence, the scope and amount of work performed has not been as much as was hoped, but satisfactory progress has been made, especially in work of a preliminary nature. This may be divided into two groups:—

- (a) Analytical methods to be employed in soil analyses, adapted to the local requirements.
- (b) Investigations into the general properties, both chemical and physical, of soils in different parts of the Colony.

2. ANALYTICAL METHODS.

Mechanical Analysis.—Practically all the recognised methods for conducting a mechanical analysis have been devised as a result of the examination of soils, the majority of which have been selected from the temperate zones. Soils of the tropics formed under conditions of high precipitation and high average temperature are admittedly of a very different nature from these. The chief difficulty expected lay in effecting the complete dispersal of the clay fraction, and consequently this point was the one chiefly investigated. With Mauritius soils, it is necessary to destroy the organic matter, in order to effect maximum dispersion. Hydrogen peroxide was the only oxidising agent employed, but it was found in every case, whatever the subsequent method might be, that the clay fraction was much larger in the samples treated with this reagent than in those without. The standard method adopted therefore included pre-treatment with hydrogen peroxide.

The exchangeable bases may be removed by leaching with either hydrochloric acid or sodium chloride, but with the former a somewhat higher clay fraction was in every case obtained than with the latter method. The final dispersion was tried with both ammonium hydroxide and sodium hydroxide, the latter proving more efficient than the former. The figures on which these findings are based are given in Tables I to III, the different fractions having been determined by the pipette method.

TABLE I
COMPARISON OF METHODS FOR EFFECTING DISPERSION.

Soil 6.

Treatment	HCl and NH_4OH		HCl and NaOH		NaCl and NaOH	
	no H_2O_2	H_2O_2	no H_2O_2	H_2O_2	no H_2O_2	H_2O_2
Coarse and Fine Sand	15.1	6.6	12.4	5.4	13.3	7.3
Silt	37.0	20.7	29.8	14.7	27.5	18.0
Clay	40.0	60.0	48.5	65.8	53.6	61.7
Moisture	9.4	9.4	9.4	9.4	9.4	9.4
Loss on Solution	...	2.4	...	2.2	...	1.6

TABLE II
COMPARISON OF METHODS FOR EFFECTING DISPERSION.

Soil 15.

Treatment	HCl and NH_4OH		HCl and NaOH		NaCl and NaOH	
	no H_2O_2	H_2O_2	no H_2O_2	H_2O_2	no H_2O_2	H_2O_2
Coarse and Fine Sand	34.3	27.5	33.0	27.4	36.7	31.9
Silt	38.0	29.5	35.5	26.3	35.7	29.2
Clay	24.2	32.7	29.5	36.2	23.4	31.1
Moisture	6.8	6.8	6.8	6.8	6.8	6.8
Loss on Solution	...	0.9	...	0.9	...	...

TABLE III
COMPARISON OF METHODS FOR EFFECTING DISPERSION.

Soil 14

Treatment	H_2O_2 , HCl, NH_4OH	H_2O_2 , HCl, NaOH	H_2O_2 , NaCl, NaOH.
Coarse and Fine Sand	12.3	8.7	12.0
Silt	19.0	18.0	18.7
Clay	53.2	58.2	55.8
Moisture	10.2	10.2	10.2
Loss on Solution	1.8	1.8	1.8

The sand fraction separated by these methods varied much in character, when viewed under the microscope. With hydrogen peroxide and hydrochloric acid pre-treatment the sand particles were uniform and bright, no aggregates being observed. With the hydrogen peroxide and sodium chloride pre-treatment, the particles were yellowish coloured, as though covered with clay, and many aggregates were seen. In all cases when no hydrogen peroxide treatment was included, the particles varied much in size, many being of a compound character and were yellow. With the H_2O_2 , HCl and NaOH treatment the sand fraction of the "Terre Franche" type resembled powdered basalt, being nearly black in colour. This method was therefore adopted as the one to be generally employed.

The effect of different times of shaking was tried, the periods being 2 hours and 8 hours. The difference between the clay fractions obtained by these two methods was negligible, but as a matter of convenience, the longer shaking period was adopted, representing a full working day for shaking. The results are given in Table IV.

TABLE IV
EFFECT OF VARYING TIME OF SHAKING.

Method used included H_2O_2 and HCl pretreatment with dispersion in sodium hydroxide solution.

Soil Time of shaking	56		18		19	
	2 hrs.	8 hrs.	2 hrs.	8 hrs.	2 hrs.	8 hrs.
Sand	not determined	6.0	not determined	5.0	5.3	5.0
Silt	13.3	12.0	10.8	11.5	12.2	11.3
Clay < 0.002	69.2	70.5	62.7	62.5	64.0	65.2
Clay < 0.001	66.0	67.5	60.0	61.2	59.7	62.2
Moisture	7.7	7.7	13.7	13.7	16.6	16.6
Loss on Solution	0.7	0.7	1.2	1.2	not determined	not determined

As an aid to dispersion, the soil when rubbed on the 0.2 mm sieve was washed with dilute sodium hydroxide solution of the same strength as that required for final dispersion.

By the method as finally adopted, efficient dispersion seems to have been obtained, but it must be pointed out that concretions are often found in the sand fractions, from soils of the more highly laterised types. These concretions may be broken down to silt by means of rubbing with a rubber pestle in a beaker, but at the present it is considered better to include such bodies in the sand fraction rather than in the silt fraction. They are in all probability formed as secondary products by the crystallisation of the lateritic constituents of the soil. In any case the amount in the soil is so low, that no big error would be introduced even if they should be considered as silt.

The chief points in the method adopted are as follows:—

- (a) Oxidation of the organic matter by means of hydrogen peroxide.
- (b) Removal of the bases by means of hydrochloric acid.
- (c) Rubbing on the 0.2 mm sieve with the 500 ccs dilute sodium hydroxide (1 gm per litre) used for final dispersion.
- (d) Shaking in a horizontal shaker for 8 hours.
- (e) Separation into fractions by the Pipette Method.

The results are calculated on an oven dry basis.

Organic Carbon.—The standard method is that of dry combustion by Dennstedt's method. Further rapid methods which were tested were the Schollenberger method, i.e. oxidation by means of a known quantity of potassium dichromate and sulphuric acid, at 175°C, the excess of chromic acid being back titrated by means of standard ferrous ammonium sulphate solution, after addition of phosphoric acid to obtain a sharp end point. Duplicate analyses made by this method agreed very well, but on the average only about 90% recovery is obtained, taking the dry combustion figure as 100%.

This method, when Nicloux's mixture, i.e. a mixture of silver and potassium dichromates, is used instead of potassium dichromate alone has given highly satisfactory results.

Duplicate analyses agree very well and almost 100% recovery is obtained, but in order to do so, care must be taken to shake the mixture in the tube continuously. It has the additional advantage that as many as twenty-five samples may be examined per day.

Results of these methods are given in Table V.

TABLE V
DETERMINATION OF ORGANIC CARBON IN SOILS BY VARIOUS METHODS.

Soil No.	Dry Combustion Method	Schollenberger Method	Modified Schollenberger Method.
3	5.58%	4.96%	5.46%
13	2.92	2.51	2.78
15	3.27	2.82	3.11
18	3.98	3.60	3.65
24	3.54	2.88	3.22
25	3.02	2.48	2.86
26	3.07	2.88	3.15
27	2.78	2.68	3.00
28	3.00	2.97	3.15
29	4.77	4.48	5.08
30	4.95	4.52	4.76
31	5.01	4.36	4.88
32	2.80	2.28	2.58
Average	3.75	3.34	3.67
Recovery	100%	89.1%	97.9%

For rapid determination, therefore, the modified Schollenberger method is employed.

Exchangeable Bases.—Various methods for determining the sum of exchangeable bases were tried, the one finally adopted being the ammonium acetate (at pH 7.0) leaching method described by Bray and Wiltshire. The determinations as made by the hydrochloric acid extraction method of Kappen were found to be somewhat too high, especially in soils low in exchangeable bases. The ammonium chloride method described by Kelly is accurate, but has certain disadvantages.

By the method as used, it was possible by one leaching to determine the total base exchange capacity (by distillation of the absorbed ammonia), the sum of exchangeable bases, the exchangeable hydrogen by difference, and the exchangeable calcium.

The titration curve was made by adding varying quantities of 0.1/N Barium hydroxide solution to a given weight of soil in a collodion dialyser, the time of contact being three days. The pH of the clear dialysate was then found by means of Clarke Indicators (Method of Pierre and Worley).

From a consideration of the figures obtained by ammonium acetate leaching method and those from the titration curves, it would seem that the soil when treated by ammonium acetate (at pH 7.0 determined by the use of indicators) is brought to a pH value in the neighbourhood of 7.2 as the exchangeable hydrogen found by this method agrees well with that obtained from the titration curve at pH 7.2. The reason for this may be that the pH of the ammonium acetate used is actually higher than pH 7.0 in spite of its showing this figure with the indicator used. Further evidence on this point is seen when the state of saturation is plotted against the pH value on a graph. By extra polation it is seen that the soil only becomes fully saturated at a pH value of 7.2 to 7.3.

3. INVESTIGATIONS INTO THE GENERAL PROPERTIES OF SOILS IN DIFFERENT PARTS OF THE COLONY.

Mechanical Analysis of Mauritius Soils.—In all, the mechanical analysis of forty nine soils has been carried out during the year, the results being given in Table VI, together with organic matter.

The percentage of stones and gravel is only a rough figure calculated on the whole soil, but is of sufficient accuracy to give some conception of the actual soil composition. All the other figures are calculated on the fine soil, i.e. that passing through a sieve containing holes 2 mms in diameter, on an oven dry basis.

The figures given in Table VI indicate the variability which might be expected of Mauritius soils, ranging from those with a clay content of more than 75% to those whose clay content is under 40% or even only 25% in one case. The samples so far analysed indicate that there are, up to the present, two well defined areas with a very large amount of clay, one being in the neighbourhood of the Central Experiment Station, Réduit, and the other round the Pamplemousses Experiment Station; in both of these areas, the soils are free from stones and gravel, and moreover they have a comparative low content of combined water (12%). Soils which approximate fairly closely to these are found in the lower Savanne, where the clay content is between 60% and 70%. At the other end of the scale, there is a large part of the higher Savanne, the higher part of Plaines Wilhems and part of Moka where the clay content is considerably less, under 50%. Some of these soils, however, are characterised by a high content of combined water, reaching in some cases to more than 20% whilst others contain only about 12%. Intermediate between these extreme types, there are soils of 50 to 70% clay content in which the combined water is intermediate.

The localities of maximum clay content, i.e. in the neighbourhoods of Réduit and Pamplemousses are widely separated, and although the temperature at the latter station is considerably higher than at the former, yet the rainfall is approximately the same, namely about 70 inches per annum. Some of the districts with the minimum clay contents are either on the windward side of the island or at the higher levels where the rainfall is in general much higher than at Réduit, the increased precipitation causing excessive leaching of the soil, resulting in a greater proportion of the lateritic constituents, which may form coarser particles by crystallisation. Where this has occurred, then the combined water content is high, approaching 20% in quantity. In some cases, however, low clay contents are associated with low combined water in the drier districts, so that there is no definite correlation between the clay content of the soil and the combined water.

The results in Table VI clearly show that the figures obtained for "loss on ignition" with soils of this type have no value in indicating the content of organic matter, since the chief part of this loss is due to the combined water, which varies from 11.3% to 20.3%.

A high "loss in solution" figure is generally associated with a high organic content, when the latter is about 5%, the loss in solution approximates to 1.5%, but when the organic matter amounts to 9 or 10% then the loss is increased to over 3% and in one case to 4.8%.

This would seem to indicate that the organic complex in the soil is rich in iron and aluminium.

The sand fractions and clay fractions separated by mechanical analysis have been kept for future work, with respect to their chemical composition.

4. CHEMICAL COMPOSITION.

Constituents soluble in strong hydrochloric acid.—The constituents soluble in strong hydrochloric acid determined in thirty five of these soils were:—ferric oxide, alumina and titanium dioxide, phosphoric oxide and the insoluble matter, the results being given in Table VII. From these analyses, the molecular Silica/Sesquioxide ratio and the molecular Silica/Alumina ratio were calculated for the fine soil, these being given in the same table.

In none of the rock samples (basalt and dolerite) so far examined has any free quartz been found, and further more in the sand fractions obtained by mechanical analysis, on only one occasion was quartz seen, and then in very small quantity. Consequently the insoluble matter which chiefly consists of silica, may be considered as the combined silica content of the soil. Very large differences have been found in the quantity of insoluble matter, ranging from 8.3% to 36.9% of the total.

It is evident that there is a distinct relationship between the climatic conditions in which the soil has been produced and the amount of insoluble residue. The soils with less than 20% insoluble residue are, with one exception (No. 15), all in the wetter parts of the island, whilst soils with more than 25% are in the drier parts. It would seem, judging from the relatively small number of results available that rainfall plays a very important part in the removal of combined silica from these soils, and that where the precipitation is great, much of the silica is removed, resulting in an increased proportion of ferric oxide and alumina—the lateritic substances—being left in the soil.

This removal of silica in the soluble form by the rainfall naturally results in big differences being found in the two ratios mol. SiO_2 /mol. R_2O_3 and mol. SiO_2 /mol. Al_2O_3 , TiO_2 when calculated on the analysis of the fine soil. The lower these ratios become, the greater is the degree to which the process of laterisation has proceeded. In some soils, as for instance in soils 2, 15, 24, 25, 45, this process has proceeded to an extreme degree, the $\text{SiO}_2/\text{Al}_2\text{O}_3$ ratio being below 0.50 in each case. On the other hand there are soils (6, 37, 38, 39) in which the ratio is over 2.00, showing that the removal of SiO_2 is not excessive.

When the percentage of combined water is plotted against the mol. Silica/Alumina ratio, it can be seen that there is a definite relationship between the two sets of figures, the coefficient of correlation being -0.94 ± 0.013 . As was noticed above, where the clay content of a soil was low, the combined water may be either high or low. When these soils are considered with regard to the mol. $\text{SiO}_2/\text{Al}_2\text{O}_3$ ratio, it is seen that in every case those with high combined water have a low ratio, and vice-versa. Consequently it would seem that the coarser fractions in these two classes of soil with low clay content may be of a very different character. In those with high combined water it would appear that the sand fractions contain even less silica than the clay fraction, and that it may have been built up as a result of the decomposition of the clay by the removal of the silica. In the other class, however, it seems probable that the coarser fractions are in the course of progressive decomposition, and have not yet reached the stage where they become clay, and consequently are richer in silica than the clay. This has not been verified by analyses made on the sand fraction, but this is in course of being done.

Exchangeable bases and hydrogen ion concentration.—The total exchange capacity, the sum of the exchangeable bases, the exchangeable calcium and the hydrogen ion concentration were determined in thirty six soils by the methods previously described and by calculation the exchangeable hydrogen, the percentage saturation and the exchangeable calcium per cent exchangeable bases were deduced. These results are given in Table VIII.

The total exchange capacity varies greatly, and it shows no close relationship with the content of inorganic colloids, on account of the organic matter in the soil. All the soils with high contents of organic matter have high total exchange capacities, in spite of the fact that they only contain small amounts of clay. The amount of exchangeable bases in the soil varies within very wide limits, the extremes being 2.3 milliequivalents at the lower limit, to 26.9 at the other. When the state of saturation is considered, it is seen that many soils are in a very highly unsaturated condition, the percentage saturation falling in one case to as low as 10.1%. All the soils having a low percentage saturation are situated in the regions with a heavy rainfall and those which are more highly saturated are in the drier regions. This scarcity of exchangeable bases in the more highly leached soils may be a point of first rate importance in the agriculture of these districts as it is quite possible that the lack of bases is acting as a limiting factor in plant growth.

The pH value of these soils was determined colorimetrically after preparing a clear soil extract by means of a collodion bag, the time of contact being 48 hours. The values found discovered ranged between pH 5.3 and pH 6.8.

From the figures herein reported, it would seem that a close relationship exists between the hydrogen ion concentration and the percentage saturation of the soils, the coefficient of correlation being $+0.96 \pm 0.01$. A fair idea of the state of saturation of the soil samples may be obtained by use of the equation:—

$$V = 50 \text{ pH} - 258.5$$

This equation can only give an approximate figure as it represents a straight line, whereas the actual graph is not a perfect straight line, but it may serve a useful purpose in that it gives a rough idea of the state of saturation, merely from a determination of the pH value.

Although this close relationship exists, no such relationship exists between the pH value and the amount of exchangeable hydrogen because of the very varying total exchange capacity. Consequently it will be impossible to use the pH values as a reliable basis to determine the amount of lime necessary to be added in order to bring the soil to a state of neutrality. The quantities of lime which would be required to neutralise the exchangeable hydrogen in many of these soils are large, quantities up to 17 tons (with soil 46) being required on a theoretical basis, but probably in practice at least 1.5 times as much as this would be required. In general, those soils which are the more highly laterised have lower total exchange capacities, so that these soils require less lime per acre than do soils in which the degree of laterisation is less, but in similar states of saturation. The great disturbing factor seems to be however the varying content of organic matter.

Approximately 87% of the exchangeable bases present in the soil samples taken as a

whole consists of calcium, thus indicating that these soils are rather poorly supplied with the other exchangeable bases, especially in those in which the sum of the exchangeable bases is low.

From a consideration of these results, it is considered that in many localities, especially in those where the soils are highly leached, field experiments to test the action of potassic fertilisers and of lime, are necessary.

Soil phosphorus.—In the twenty three soils examined for soil phosphorus, the quantity soluble in strong hydrochloric acid varies between fairly wide limits, 0.17o/o to 0.54o/o, the general figures generally falling between 0.2% and 0.3%. These soils may be considered to be fairly rich in phosphorus, but in the thirteen soils examined for phosphoric oxide soluble in 1% citric acid, it was found that only about 1% of the total may be regarded as being in the available state. This is no doubt due to the high fixing powers of these soils on account of their high content of ferric oxide and alumina, the phosphates of iron and aluminium being comparatively insoluble in this reagent. Eleven of the soils for which the relative solubility was known were examined for water soluble phosphates, and in only three was water soluble phosphorus found in sufficient quantity to be determined. The fact that in these soils the relative solubility was higher than in the remainder may not be without significance, in that it may be that a high relative solubility shows that there is a sufficient supply of available phosphorus in the soil for normal plant growth.

5. MOISTURE AT 50% RELATIVE HUMIDITY.

The figures, which are a measure of the colloidal properties of a soil, show no relationship to the quantity of inorganic colloids (clay) or to the quantity of organic matter. When these figures are plotted against the total exchange capacity, a rough correlation may be noticed, as would be expected from the fact that both are properties of the colloidal constituents of the soil. The correlation is not close enough, however, to enable the total exchange capacity to be calculated from a determination of the moisture content at 50o/o Relative Humidity.

6. GENERAL CONSIDERATION OF THE RESULTS.

Up to the present, no single property has been found which shows a close correlation with the clay content of the soil. This is no doubt due to the fact that the clay is a variable proportion of the total soil colloids, and that the colloidal properties of the organic fraction are much greater per unit than those of the inorganic fraction. The influence of the inorganic fraction is therefore masked because of the big variation in the organic fraction. In order to give a complete idea of the soil texture, it is considered necessary to do a mechanical analysis, as by no other means can accurate information be obtained as to the amount of clay present.

The degree of laterisation of any particular soil may be accurately gauged from a determination of the combined moisture, a determination which may very easily be made, especially when the modified Schollenberger Method of determining organic carbon is employed. In this way those soils with a comparatively small amount of clay and large amount of sand may be divided into two groups, those where laterisation has proceeded to an extreme degree and those in which it is only slight.

A determination of the pH value affords a reliable guide as to the state of saturation of the soil colloids, but does not give definite information as to the quantity of lime to be applied to the soil in order to neutralise it. An estimation, however, of the total exchange capacity will enable a fairly accurate estimation of the absolute amounts of exchangeable bases and hydrogen in the soil, so that the lime requirements may be calculated.

When the soils are classified from the clay content and the combined moisture, as is done in Table IX, it may be remarked that soils with similar properties formed under similar conditions are grouped together. It has already been suggested that the sand fraction may vary according to its origin. First of all it may be formed during the process of decomposition, resulting in the ultimate production of clay, or it may be formed as a result of the decomposition of the clay fraction, which loses part of its silica. The former class of sand will of necessity have a much higher mol. $\text{SiO}_2/\text{Al}_2\text{O}_3$ than the latter, since the process of laterisation is one in which the silica is removed in the soluble form. The sandy soils with a high mol. $\text{SiO}_2/\text{Al}_2\text{O}_3$ ratio are situated in the top left hand portion of the table. Those soils, which are known locally as "Terres franches" are placed in the lower part, with a clay content of approximately 60 to 80%, and a combined water content of from 12 to 16%. The soils with a relatively high content of sand formed by the decomposition of the clay are situated in the top right hand portion of the table. It may be noticed that not a single one of the thirty five soils so classified is placed in the bottom right hand portion. If the theory as to the formation of these soils is correct, it is theoretically improbable to find a soil with a high clay content of from 70 to 80% giving a high content of combined moisture of 18 to 20%. The average mol. $\text{SiO}_2/\text{Al}_2\text{O}_3$ ratio for the soils in the top left hand portion, bottom portion and top right hand portion are respectively 2.01, 1.45 and 0.58, which indicates a progressive decomposition from the first to the last.

Whilst the results are not sufficiently numerous to warrant any very definite description of the different soil types, it would appear that the pH value of soils of the intermediate type are in general appreciably higher than that of those of the more highly laterised type. These soils are therefore poorer in exchangeable bases than are the "Terres Franches," and consequently they may be expected to respond the better to applications of lime and potassium fertilisers.

During the preceding discussion the molecular $\text{SiO}_2/\text{Al}_2\text{O}_3$ ratio has been considered in every instance, but it should be noted that the molecular $\text{SiO}_2/\text{R}_2\text{O}_3$ ratio might equally well have been considered, as where a correlation has been noted with the former, there is also a correlation with the latter.

7. SOIL MOISTURE DETERMINATIONS.

The soil moisture in six soil samples per week was determined in connection with the cane growth measurement experiments.

Reduit,
5th February, 1932.

N. CRAIG,
Bio-Chemist,
i/c Sugarcane Research Station.

TABLE VI

MECHANICAL ANALYSIS OF MAURITIUS SOILS

Sample No.	Coarse Sand	Fine Sand	Silt	Clay	Organic Matter	Combined Water	Loss in Solution	Stones and Gravel
2	14.9	18.7	18.2	40.6	7.90	17.60	...	...
3	2.8	24.0	26.5	37.2	12.29	18.37	4.5	...
6		6.1	16.2	72.6	5.70	12.70	...	Free
9		5.5	14.0	75.7	5.7	12.2	...	...
13	2.4	10.7	23.5	54.7	5.6	18.4	...	...
14	1.2	8.5	20.0	64.8	5.2	14.3	...	...
15	15.7	13.7	28.2	38.8	5.9	16.9	...	Gravelly
18		5.8	18.3	72.3	7.78	13.8	...	...
19		6.0	13.6	78.2	2.1	13.4	...	...
20		9.3	17.6	67.0	5.3	14.1	...	...
21		8.9	22.9	62.4	6.5	15.3	...	...
22		7.3	16.3	69.8	5.0	12.5	...	...
23		9.9	22.0	62.1	5.2	15.4	...	...
24	2.7	18.4	27.1	48.8	6.8	19.5	1.4	1.0
25	4.7	21.6	27.0	45.7	5.8	20.3	1.5	4.0
26	7.5	24.4	25.2	39.8	5.8	18.8	1.4	3.0
27	1.8	17.0	25.7	52.8	5.3	19.4	1.4	3.0
28	1.9	19.6	29.2	46.4	5.7	18.7	1.8	1.0
29	2.8	16.1	22.6	43.3	9.1	18.4	3.1	20.0
30	9.4	22.2	19.6	39.1	9.9	12.4	3.2	37.0
31	5.2	18.9	22.7	44.1	9.9	16.4	3.1	34.0
32	2.1	13.0	28.4	56.4	5.3	16.5	1.3	1.0
33	6.1	19.6	20.1	43.6	9.8	15.6	3.4	14.0
34	5.9	12.4	19.4	61.0	5.6	15.3	1.3	2.0
35	2.1	11.3	17.9	61.4	6.4	14.7	1.3	6.0
36	5.1	22.5	26.7	44.8	5.6	17.2	1.4	12.0
37	2.6	10.1	18.5	63.8	4.7	11.8	1.2	9.0
38	3.5	16.4	21.1	54.5	5.6	11.3	1.4	30.0
39	5.0	15.7	24.9	48.0	6.8	12.0	2.3	48.0
40	4.6	25.1	26.4	42.6	5.2	13.0	1.6	2.0
41	4.5	18.3	21.0	47.3	9.3	15.3	2.9	34.0
42	0.5	7.1	16.8	71.8	5.1	13.9	1.6	3.9
43	1.2	14.6	22.8	55.6	5.1	14.7	1.8	8.0
44	3.5	21.5	24.3	47.9	5.1	19.6	1.7	9.0
45	4.4	19.0	29.8	43.9	6.4	20.2	1.9	6.0
46	3.3	16.5	18.9	45.6	10.5	16.5	4.8	33.0
47	2.3	15.0	15.5	60.7	...	...	1.9	0.0
48	0.7	11.5	21.0	59.1	...	...	2.1	26.0
49	0.7	11.0	25.4	58.6	...	...	1.8	5.0
50	0.9	11.1	21.8	56.8	...	...	1.8	25.0
51	1.3	15.6	25.6	49.6	...	...	1.6	13.0
52	14.1	6.7	9.8	60.0	...	...	1.6	12.0
53	4.0	8.9	16.9	66.4	...	...	2.0	9.0
54	0.8	11.5	26.2	57.3	...	...	2.1	1.0
55	0.3	15.6	30.7	56.5	...	...	2.5	0.0
56		6.5	13.0	76.5	2.7	12.8	0.8	0.0
57		6.1	12.7	74.9	4.1	13.1	1.2	0.0
58	7.4	37.8	21.8	25.1	7.7	9.7	3.2	some

TABLE VII

CONSTITUENTS SOLUBLE IN HYDROCHLORIC ACID (STRONG)

Sample No.	Insoluble Matter	Fe ₂ O ₃	Al ₂ O ₃ / TiO ₂	P ₂ O ₅	Mol. SiO ₂ /R ₂ O ₃	Mol. SiO ₂ /Al ₂ O ₃	Combined Water
2	10.8	29.6	38.6	0.21	0.32	0.49	17.60
3	11.5	30.9	36.6	0.26	0.34	0.53	18.37
6	32.7	20.3	27.6	0.26	1.37	2.02	12.70
7	29.8	20.0	28.6	0.25	1.23	1.77	12.50
9	27.9	24.4	30.0	0.23	1.04	1.58	12.2
10	28.8	23.7	28.6	0.31	1.12	1.71	13.1
13	14.8	23.6	38.7	0.41	0.45	0.61	18.4
14	24.5	22.9	33.2	0.26	0.89	1.26	14.3
15	9.6	32.1	36.0	0.37	0.29	0.45	16.9
20	28.9	22.6	30.4	0.25	1.09	1.61	14.1
21	23.6	23.2	32.2	0.29	0.85	1.25	15.3
22	30.6	24.6	28.4	0.28	1.18	1.83	12.5
23	22.9	24.3	33.7	0.24	0.79	1.16	15.4
24	10.2	25.3	40.4	0.25	0.29	0.43	19.5
25	8.3	28.6	39.6	0.17	0.25	0.36	20.3
26	11.3	26.7	38.4	0.25	0.34	0.50	18.8
27	13.8	25.4	39.8	0.25	0.41	0.59	19.4
28	13.5	24.8	36.4	0.34	0.43	0.64	18.7
29	16.1	22.5	32.5	0.25	0.59	0.84	18.4
30	28.3	21.2	26.3	0.25	0.93	1.83	12.4
31	20.3	20.8	33.7	...	0.73	1.02	16.4
32	14.0	25.9	35.9	0.33	0.45	0.67	16.5
33	18.9	25.1	31.7	0.25	0.67	1.02	15.6
34	22.0	25.6	29.7	0.54	0.82	1.26	15.3
35	23.8	22.0	31.6	...	0.89	1.28	14.7
36	13.1	23.8	40.5	...	0.40	0.55	17.2
37	34.1	21.1	26.3	...	1.44	2.20	11.8
38	36.9	20.0	25.6	...	1.64	2.45	11.3
39	33.2	21.2	23.2	...	1.37	2.00	12.0
40	23.0	21.3	30.6	...	1.08	1.56	13.0
41	22.2	22.0	32.3	...	0.82	1.17	15.3
42	23.9	23.4	33.0	...	0.85	1.23	13.9
43	21.3	23.1	35.8	...	0.70	1.01	14.7
44	13.3	23.2	39.3	...	0.42	0.58	19.6
45	9.6	25.9	39.4	...	0.29	0.42	20.2

TABLE VIII

EXCHANGEABLE BASES AND pH

Soil No.	T	S	H	Ca	V	Ca% S	pH	Moisture at 50% Relative Humidity
2	18.1	3.3	14.8	3.9	18.2	100	5.6	5.72
3	29.6	3.0	26.6	2.8	10.1	93	5.35	10.55
6	24.8	14.8	10.0	13.8	59.7	93	6.1	6.22
7	32.0	25.7	6.3	20.4	80.3	79	6.8	7.83
9	25.3	17.4	7.9	14.3	68.8	82	6.4	6.62
10	31.5	26.9	4.6	21.1	85.4	78	6.7	7.23
13	21.4	5.2	16.2	6.5	24.3	100	5.7	6.31
14	26.1	18.7	7.4	15.4	71.6	82	6.55	5.54
15	19.0	14.0	5.0	13.8	73.7	98	6.7	4.09
20	27.2	15.5	11.7	13.3	57.0	86	6.4	7.1
21	28.3	17.0	11.3	10.8	60.2	99	6.4	6.7
22	26.1	17.7	8.4	14.8	67.8	84	6.55	6.56
23	23.4	8.5	14.9	8.4	36.3	99	5.9	6.48
24	23.2	5.5	17.7	5.1	23.9	93	5.6	6.74
25	18.5	2.3	16.2	2.2	12.5	93	5.6	6.47
26	20.2	4.4	15.8	3.6	21.7	82	5.7	6.24
27	21.9	6.7	15.2	5.5	30.5	82	5.75	6.99
28	23.8	7.7	16.1	6.9	32.1	89	5.6	7.21
29	30.8	12.4	18.4	9.5	40.0	77	5.95	9.84
30	30.8	9.9	20.9	7.9	31.9	79	5.75	9.71
31	31.6	9.8	21.8	7.8	30.7	80	5.75	9.91
32	16.9	7.0	9.9	5.3	41.1	83	5.95	6.83
33	27.3	3.7	23.6	3.1	13.6	84	5.5	9.93
34	22.2	9.4	12.8	7.2	42.3	77	5.95	8.12
35	29.1	6.3	22.8	5.6	21.8	89	5.75	9.44
36	25.5	4.5	21.0	4.6	17.7	100	5.9	7.16
37	26.0	14.1	11.9	12.6	54.2	89	6.38	6.43
38	32.9	22.0	10.9	17.4	66.8	79	6.65	7.80
39	34.0	17.1	16.9	15.7	50.2	92	6.0	8.65
40	21.2	7.9	13.3	6.6	37.2	84	5.8	5.62
41	37.8	13.0	24.8	...	34.4	...	5.95	11.27
42	25.2	7.7	17.5	...	30.6	...	5.85	5.92
43	22.9	5.5	17.4	...	24.0	...	5.5	6.01
44	23.5	3.1	20.4	...	13.2	...	5.5	6.28
45	21.9	3.1	18.8	...	14.2	...	5.55	7.13
46	38.3	4.3	34.0	...	11.2	...	5.65	11.12

TABLE IX.

Classification of soils from the clay content and the combined moisture content.

Combined Water Clay	10-12%	12-14%	14-16%	16-18%	18-20%	20-22%
30-40%	.....	30, Rose Belle, 5.75 ; 1.83	.....	2, Curepipe, 5.6 ; 0.49 15, Deep River, 6.7 ; 0.45	26, Britannia, 5.7 ; 0.50 3, Bois Chéri, 5.35 ; 0.53	.....
40-50%	.....	39, Trianon, 6.0 ; 2.00 40, Mon Désert, 5.8 , 1.56	33, Trou-aux- Cerfs, 5.5 ; 1.02 41, Mon Désert, 5.95 ; 1.17	31, Rose Belle, 5.75 ; 1.02 36, Hermi- tage, 5.9 ; 0.55 46, Alma, 5.65 ;	24, Britannia, 5.6 ; 0.43 28, Britannia, 5.6 ; 0.64 29, Rose Belle, (New Grove) 5.95 ; 0.84 44, Alma, 5.5 ; 0.58	25, Britan- nia, 5.6 ; 0.36 45, Alma, 5.55 ; 0.42
50-60%	38, Trianon, 6.65 ; 2.45	.....	43, Mon Désert, 5.5 ; 1.01	32, Réunion, 5.95 ; 0.67	13, Circons- tance, 5.7 ; 0.61 27, Britannia, 5.75 ; 0.59	.....
60-70%	37, Trianon, 6.3 ; 2.20	22, Union- Ducray, 6.55 ; 1.83	14, Beau Champ, 6.55 ; 1.26 20, Savannah, 6.4 ; 1.61 21, Rivière des Anguilles, 6.4 ; 1.25 23, St. Aubin, 5.9 ; 1.16 34, Highlands, 5.75 ; 1.26 35, Bagatelle, 5.9 ; 1.28	.....	.....	.....
70-80%	.....	6, C.E.S., 6.1 ; 2.02 9, Mon Rocher, 6.4 ; 1.58 18, C.E.S., 6.2 19, C.E.S., 6.1 42, Mon Désert, 5.85 ; 1.23	.....	.....	.....	.....

NOTE :—The first number is the sample number, followed by the location. The figures which follow indicate the pH value and the molecular $\text{SiO}_2/\text{Al}_2\text{O}_3$ ratio respectively.

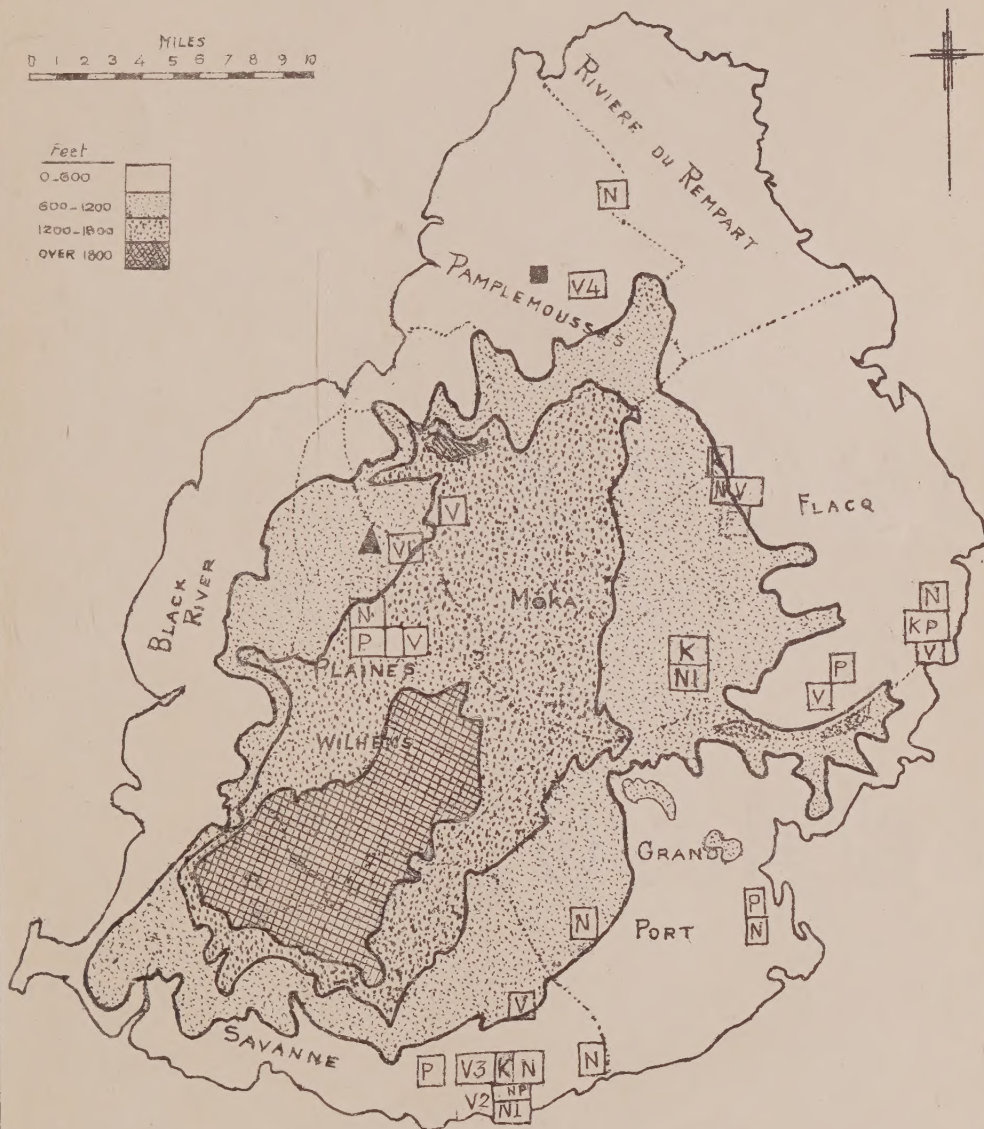
TABLE X

INDEX OF SOIL SAMPLES AND THEIR LOCATION

Sample No	Location	Sample No	Location
1	Corson Estate, Curepipe	30	Rose Belle, F. 102
2	Corson Estate, Curepipe	31	Rose Belle, Wireless, F. 52
3	Bois Chéri Tea Estate	32	Réunion S.E. F. 29
4	Bois Chéri Tea Estate	33	Réunion S.E., Martial, Trou aux Cerfs
5	F. 10, plot 4, C.E.S.	34	Highlands, F. 31
6	F. 12, C.E.S.	35	Bagatelle, F. 50, 51
7	F. 13, C.E.S.	36	Hermitage, F. 34
8	Yield Trials Mon Rocher	37	Trianon, St. Jean, F. 20
9	Variety Plot, Mon Rocher	38	Trianon, Lapeyre Henriette
10	F. 1, P.E.S.	39	Trianon, Bigara, F. 5
11	F. 5, P.E.S.	40	Mon Desert, Dr. Clarenc, F. 48
12	Variety Plot, Circonstance	41	Mon Desert, Carreau Chinois, F. 38
13	Yield Trial, Circonstance	42	Mon Desert, Minissy, F. 28
14	Beau Champ S.E.	43	Mon Desert, Helvetia, F. 31, Carreau Adrien
15	Deep River S.E.	44	Alma-Bar-le-duc, Carreau Roessard
16	Deep River S.E.	45	Alma—Piston
17	F. 12, P.E.S.	46	Alma—Finiss Vayapoory
18	F. 14, C.E.S., Top Soil	47	Belle Rive, G.R.S.E.
19	F. 14, C.E.S. Sub Soil	48	Rich Fund F. 2, Desmarais
20	M. Expt, Savannah	49	Rich Fund F. 7
21	M. Expt, Rivière des Anguilles	50	Rich Fund, F. 33
22	Yield Trial, Union Ducray	51	Rich Fund, F. 48
23	Yield Trial, St. Aubin	52	Le Val, Bergicourt
24	Riche Bois, Britannia, F. 6	53	Le Val, Cent Piastres, F. 25
25	Britannia, Tivoli, F. 224	54	Le Val, Eau Bleue
26	Britannia, St. Avoild, F. 92	55	Le Val, St. Hubert, A. 12
27	Britannia, F. 94	56	Belle Vue Harel, F. Camp
28	Britannia, Colmar F. 33	57	Beau Séjour, Schoenfeld
29	Rose Belle, New Grove, F. 50	58	Grand Bay, Filature

MILES
0 1 2 3 4 5 6 7 8 9 10

Feet
0-500
500-1200
1200-1800
OVER 1800



1. Location of Experiment Stations Variety yield trials and manurial trials

Reference.....
 ▲ - Central Experiment Station
 ■ - Pamplemousses Experiment Station.
 N - Nitrogen Manurial Trial.
 P - Phosphate.
 K - Potash.
 V - Variety yield Trial.

The number following V indicates the number of trials in progress in this locality.

